

NPS Management Program Document

Tennessee Department of Agriculture
Water Resources Section



Nonpoint Source pollution is best defined as a contrast to point sources of pollution. While point sources of pollution are transported to surface and ground water by a discernable and defined conveyance, such as a pipe or a ditch, nonpoint sources are transported to surface and ground water through overland flow or general runoff from the areas adjacent to the water resource. Examples of nonpoint source pollution include runoff from residential neighborhoods, construction sites, abandoned mining operations, agricultural operations, and forestry activities. Additional sources of nonpoint source pollution include affects to water resources caused by stream modifications, failing septic tank systems, and the non-permitted disposal of solid waste.

Section 319 of the federal Clean Water Act establishes the Nonpoint Source Program, and requires that states develop a Management Program to establish direction for the program. In essence, this Management Program is a strategic plan. The Tennessee Department of Agriculture Nonpoint Source Program (TDA-NPS Program) has developed this revision to the Management Program, which was originally approved by the US Environmental Protection Agency (EPA) on September 1, 1989. This revision sets specific long term goals for the TDA-NPS Program for the next fifteen years, and sets specific short term action items to be accomplished within the next five to ten years, for each category of nonpoint source pollution.

TDA-NPS Program Vision Statement

TDA-NPS Program will be the most effective provider of 319 funding in the nation as we seek to restore and protect Tennessee's water resources from nonpoint sources of pollution.

TDA-NPS Program Mission Statement

*The mission of the TDA-NPS Program is to:
Measurably reduce nonpoint source pollution in Tennessee,
Measurably improve Tennessee's water quality,
Continuously strengthen and expand partnerships, and
Increase the water resources stewardship of Tennessee's citizens.*

TDA-NPS Program Long Term Goals

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, strengthen existing partnerships and to foster greater trust, commitment and accountability.

Long Term Goal 2.

Fully implement all developed TMDLs for nonpoint sources in compliance with existing regulations, policies, or agreements by 2015.



Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

Long Term Goal 4.

Beginning in 2006, through regulatory and non-regulatory means, prevent previously unlisted waters from being included on the 303(d) List because of nonpoint source impairments.

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution.

Long Term Goal 6.

Through the process of continuous improvement, routinely assess all programmatic functions of the TDA-NPS Program in order to maximize efficiency, decrease the bureaucratic burden and increase the numbers of participants in the program.

Long Term Goal 7.

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

The success of this Management Program is heavily dependent upon partnerships with other public agencies, non-profit associations, local governments, and private citizens. Within each source chapter of the Management Program (Section 1), a commitment is made to conduct regular meetings of working groups. This process will ensure that lines of communication are created and maintained between the TDA-NPS Program and its partners, and it will result in the creation of more 319 projects. This will also help meet our Long Term program goals.

The most ambitious long term goal involves the restoration of all waters impaired by nonpoint sources listed on the 1998 303(d) List by 2015. Obviously, this goal will never be reached without the close coordination and commitment of all partners to this goal. The TDA-NPS Program will make reaching consensus on this issue with all partners its highest priority. This goal will also not be reached without an increase in the educational materials provided to elected officials, public and private agencies, landowners, developers, local citizens, etc.

Additional areas where the TDA-NPS Program will emphasize improvements are:

- Expand the use of the Internet to educate, transfer technology, and provide faster and higher quality service to partners and contractors.
- Sponsor the annual Tennessee Nonpoint Source Partnership Conference, to provide opportunities for partners from across the state to network together and for new or innovative nonpoint source solutions to be discussed.
- Encourage the creation of locally led watershed teams across Tennessee.



- Shorten the time between the submittal of a project proposal and the execution of a contract for the project.
- Establish watershed restoration action strategies for all priority watersheds identified through the Unified Watershed Assessment process.



This document is a revision of Tennessee's Nonpoint Source Management Program, which was originally approved by the US Environmental Protection Agency on September 1, 1989.

TDA-NPS Program Vision Statement

TDA-NPS Program will be the most effective provider of 319 funding in the nation as we seek to restore and protect Tennessee's water resources from nonpoint sources of pollution.

TDA-NPS Program Mission Statement

*The mission of the TDA-NPS Program is to:
Measurably reduce nonpoint source pollution in Tennessee,
Measurably improve Tennessee's water quality,
Continuously strengthen and expand partnerships, and
Increase the water resources stewardship of Tennessee's citizens.*

In order to realize the vision and accomplish the mission, the TDA-NPS Program has developed seven long term goals or guiding principles. These statements form the basis for future program direction.

Long Term Goal 1

Hold regularly scheduled meetings with stakeholders, to create new partnerships, strengthen existing partnerships and foster greater trust, commitment and accountability.

Long Term Goal 2

Fully implement all developed TMDLs for nonpoint sources in compliance with existing regulations, policies or agreements by 2015.

Long Term Goal 3

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state, and federal partners.

Long Term Goal 4

Beginning in 2006, through regulatory and non-regulatory means, prevent previously unlisted waters from being included on the 303(d) List because of nonpoint source impairments.

Long Term Goal 5

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution.



Long Term Goal 6

Through the process of continuous improvement, routinely assess all programmatic functions of the TDA-NPS Program in order to maximize efficiency, decrease the bureaucratic burden, and increase the numbers of participants in the program.

Long Term Goal 7

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the TDA-NPS Program.

This management plan is divided into three sections. Section 1 consists of the source chapters, one for each of the different categories of nonpoint source pollution. Additionally, there are chapters on TMDLs, Education, Water Quality Monitoring, and Ground Water. Section 2 consists of the Program Management portion of the TDA-NPS Program, and Section 3 pertains to the eleven Priority Watersheds.

Each of the chapters in Sections 1-3 have milestones included. In each chapter, the TDA-NPS Program's long term goals are restated, and applicable and specific action items are included. These action items will be the basis of all future 319 projects in Tennessee. TDA-NPS Program will tie each future project to a specific long term goal and a short term action item.

1. The State program contains explicit short-term and long-term goals, objectives, and strategies to protect surface and ground water.

ELEMENT MILESTONE	Section(s)
A. State program includes a vision statement.	Executive Summary
B. State has specific long-term goals that are linked to its vision and are directed towards the expeditious achievement and maintenance of beneficial uses of water.	Goals 1-7
C. State has specific short-term (e.g., 1-5 year) objectives, expressed as activities, that are linked to its goals.	All chapters
D. State has identified measures and indicators that will be used to assess the state's success in achieving its goals and objectives.	All chapters
E. State has identified specific, expeditious milestones for its activities.	All chapters
F. State has identified implementation steps and the expected effects of those steps on its water resources.	See 'Solutions' section of all chapters

2. The State strengthens its working partnerships and linkages with appropriate State, Tribal, regional, and local entities (including conservation districts), private sector groups, citizens groups, and federal agencies.

A. The State uses a Statewide collaborative team, NPS task force, or advisory group, or other appropriate process, to provide for input and recommendations from representatives of Federal, state, Tribal, and local agencies, private sector groups and citizens groups, regarding NPS program direction, project selection, and other similar aspects of program administration.	Long Term Goal 1
B. The task force meets regularly and promotes collaborative and inclusive decision making.	Long Term Goal 1, and Action items
C. The State program specifies procedures to provide for periodic public review.	319 Rules, Long Term Goal 1
D. The State effectively incorporates a variety of organizations and interests into its implementation of NPS activities and projects.	Long Term Goal 1, and Action items
E. The state uses its partnerships effectively to avoid the transfer of problems among environmental media.	Long Term Goal 1, and Action items

3. The State uses a balanced approach that emphasizes both statewide NPS programs and on-the-ground management of individual watersheds where waters are impaired and threatened.

A. Annual or multi-year work plans contain NPS implementation actions directed at both specific priority watersheds and activities of a Statewide nature.	Section 2 Program Management
B. State tracks both Statewide activities and watershed projects.	Section 2 Program Management
C. State has institutionalized its program beyond the annual implementation of 319-funded activities and projects.	Long Term Goal 1
D. State uses an integrated watershed approach for assessment, protection and remediation that is well integrated with other water or natural resource programs.	Section 1 'Water Quality Monitoring

4. The State program (a) abates known water quality impairments from NPS pollution and (b) prevents significant threats to water quality from present and future activities.

A. State has comprehensively characterized water quality impairments and threats throughout the State which are caused or significantly contributed to by NPSs.	See appendix for 303(d) List and 305(b) Report
B. State has comprehensively characterized reasonably foreseeable water quality impairments and threats that are likely to be caused by NPS pollution in the future.	See appendix for 303(d) List and 305(b) Report
C. State program addresses all significant NPS categories and subcategories	Section 1 all chapters
D. State program has identified specific programs to abate pollution from categories of NPSs which causes or substantially contribute to the impairments identified in its assessments.	Section 1 all chapters
E. State has identified specific programs to prevent future water quality impairments and threats that are likely to be caused by NPS pollution.	Long Term Goal 4 and action items, all chapters

5. The State program identifies waters and their watersheds impaired by NPS pollution and identifies important unimpaired waters that are threatened or otherwise at risk. Further, the State establishes a process to progressively address these identified waters by conducting more detailed watershed assessments and developing watershed implementation plans, and then by implementing the plans.

A. State water quality assessments (including those performed under Section 305(b), 319(a), 303(d), 314, and others), along with analysis of changing land uses within the state, form the basis for the identification of the State's planned NPS activities and projects.	"Extent of Problem" Section--All chapters Long Term Goal 3
B. State activities focus on remediating the identified impairments and threats, and on protecting the identified at-risk waters.	"Extent of Problem" Section--All chapters Long Term Goal 3
C. State has provided for public participation in the overall identification of problems to be addressed in the State program, and in the establishment of a process to progressively address these problems.	Long Term Goal 1
D. State NPS priorities are communicated to, consistent with, and reflected in program planning and implementation activities by other water resource management agencies operating within the State.	Long Term Goal 1
E. State revises its identification of waters and revisits its process for progressively addressing these problems periodically (e.g., once every 5 years).	See Section 1: "Water Quality Monitoring"

6. The State reviews, upgrades, and implements all program components required by Section 319(b) of the Clean Water Act, and establishes flexible, targeted, and iterative approaches to achieve and maintain beneficial uses of water as expeditiously as practicable. The State programs include: (a) A mix of water quality-based and/or technology-based programs designed to achieve and maintain beneficial uses of water; and (b) A mix of regulatory, non-regulatory, financial and technical assistance as needed to achieve and maintain beneficial uses of water as expeditiously as practicable.

The state includes in its program and implementation the following eight items:

1A. Identification of the measures to be used to control NPS pollution, focusing on those measures which will be most effective to address the specific types of NPS pollution prevalent within the State. These measures may be individually identified or presented in manuals or compendiums, provided that they are specific and are related to the category or subcategory of NPS. They may also be identified as part of a watershed approach towards achieving water quality standards, whether locally, within a watershed, or Statewide;	Section 1 All chapters
1B. Identification of programs to achieve implementation of the measures;	Section 1 All chapters
1C. Processes used to coordinate and , where appropriate, integrate various programs used to implement NPS controls in the State;	Section 1 All chapters
1D. A schedule with goals, objectives, and annual milestones for program implementation; legal authorities to implement the program; available resources; and institutional relationships;	Section 1 All chapters
1E. Attorney General certification (if program is changed substantially);	N/A
1F. Sources of funding from Federal (other than 319), State, local, and private sources;	Section 1 – Other Funding Sources
1G. Identification of Federal programs and projects that the state will review for their effects on water quality and their consistency with the State program; and	Long Term Goal 1. Action Items All Chapters
1H. Monitoring and other evaluation programs to help determine short-term and long-term program effectiveness.	Long Term Goals 6 and 7

The State also incorporates or cross-references existing baseline requirements established by other applicable federal or state laws to the extent that they are relevant. Examples include but are not limited to:

2A. State Forest Management Practices Acts;	Section 1 Silviculture
2B. State construction, erosion or nutrient management laws; and	Section 1 Construction, Hydromodification, and Agriculture
2C. Federal or State transportation laws which govern construction site or maintenance Runoff.	Section 1 Construction, and Hydromodification

7. The State identifies Federal lands and activities which are not managed consistently with State NPS program objectives. Where appropriate, the State seeks EPA assistance to help resolve issues.

A. The State reviews Federal financial assistance programs, developing projects, and other activities that may result in NPS pollution for consistency with the State program.	Long Term Goal 1
B. The state works with federal agencies to resolve potential inconsistencies between Federal programs and activities and the State programs.	Long Term Goal 1
C. Where the State cannot resolve Federal consistency issues to its satisfaction, it requests EPA assistance to help resolve the issues.	Long Term Goal 1
D. The State coordinates with Federal agencies to promote consistent activities and programs, and to develop and implement joint or complementary activities and programs.	Long Term Goal 1

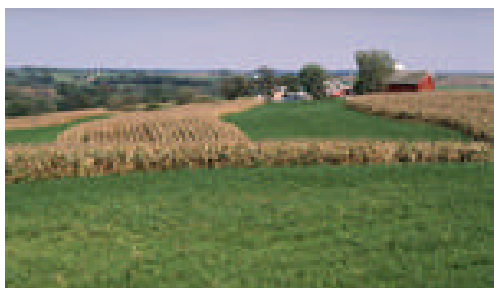
8. The State manages and implements its NPS program efficiently and effectively, including necessary financial management.

A. The State's plans for watershed projects and Statewide activities are well-designed, with sufficient detail to assure effective implementation.	Section 2
B. The State's watershed projects focus on the critical areas, and critical sources within those areas, that are contributing to NPS problems.	Section 2
C. State implements its activities and projects, including all tasks and outputs, in a timely manner.	Section 2
D. State has established systems to assure that the State meets its reporting obligations.	Section 2
E. State utilizes the Grants Tracking and Reporting System effectively	Section 2
F. State has developed and uses a fiscal accounting system capable of tracking expenditures of both 319 funds and non-Federal match.	Section 2
G. NPS projects include appropriate monitoring and/or environmental indicators to gauge effectiveness.	Section 2

9. The State periodically reviews and evaluates its NPS management program using environmental and functional measures of success, and revises its NPS assessment and its management program at least every five years.

A. The State has and uses a process to periodically assess both improvements in water quality and new impairments or threats.	Section 1 Water Quality Monitoring
B. The State uses a feedback loop, based on monitoring and other evaluative information, to assess the effectiveness of the program in meeting its goals and objectives, and revises its activities and tailors its annual work plans, as appropriate, in light of its review.	Long Term Goal 6
C. Using its feedback loop, the State periodically reviews and assesses the goals and objectives of the NPS management program, and revises the program as appropriate in light of its review.	Long Term Goal 6
D. The State's annual report successfully portrays the State's progress in meeting milestones, implementing BMPs, and achieving water quality goals.	Long Term Goal 6

INTRODUCTION



Agriculture is Tennessee's largest industry. Tennessee farmers are stewards of the lands they farm, because their livelihood depends on it. Net income from farming operations in Tennessee totaled \$343.3 million dollars in 1998. Forty-four percent of the land area of Tennessee is farmland, comprising 11.9 million acres (1998 figures). There are water quality problems associated with some agricultural operations.

Excessive soil erosion from row crop land, animal waste generated from Concentrated Animal Feeding Operations (CAFOs), livestock access to streams, improper grazing practices, and excessive pesticide usage are some of the problems that need to be addressed.

DESCRIPTION

In 1998, there were an estimated 91,000 farms in Tennessee. A farm is defined, for purposes of this chapter, as a place which could sell \$1,000 dollars of agricultural products annually. The following table lists the 1998 national ranking of Tennessee's agricultural production:

CROP	1998 National Ranking	Production
Corn for Grain	18	59,520,000 bu
Cotton	10	546,000 bales
Sorghum for Grain	14	1,120,000 bu
Soybeans	17	35,090,000 bu
Tobacco	3	111,100,000 pounds
Winter Wheat	20	15,170,000 bu
Beef Cows	9	1,030,000 head
Milk Cows	22	100,000 head
Market Hogs	22	260,000 head
Poultry (Broilers)	Not available	159,200,000 birds
Equine	3	190,000 head

1.1 AGRICULTURE

Agricultural production varies geographically across Tennessee. The following table lists the top ten producing counties for each of the crops listed, and the grand division of the state they are located.

Rank	Corn	Cotton	Soybeans	Tobacco	Wheat
1	✚Obion	✚Haywood	✚Gibson	●Robertson	✚Gibson
2	✚Weakley	✚Crockett	✚Dyer	◆Greene	✚Obion
3	✚Gibson	✚Tipton	✚Obion	●Montgomery	✚Dyer
4	●Robertson	✚Fayette	✚Weakley	●Macon	✚Weakley
5	✚Henry	✚Lauderdale	✚Lauderdale	◆Claiborne	●Robertson
6	✚Dyer	✚Gibson	✚Tipton	●Sumner	✚Lake
7	✚Carroll	✚Madison	✚Shelby	◆Washington	✚Henry
8	●Franklin	✚Dyer	✚Lake	◆Hawkins	✚Lauderdale
9	●Montgomery	✚Shelby	✚Fayette	◆Grainger	●Franklin
10	✚Lauderdale	✚Hardeman	✚Haywood	●Smith	✚Tipton
Rank	Beef Cows	Milk Cows	All Hogs	Alfalfa Hay	All Other Hay
1	◆Greene	◆Greene	✚Weakley	●Robertson	◆Greene
2	●Lincoln	◆McMinn	✚Henry	◆Greene	●Lincoln
3	●Maury	◆Washington	✚Fayette	◆Washington	●Maury
4	●Giles	◆Monroe	✚Obion	●Maury	●Williamson
5	●Wilson	●Marshall	●Franklin	●Marshall	●Giles
6	●Lawrence	●Lincoln	✚Madison	◆Sullivan	●Bedford
7	●Bedford	◆Loudon	✚McNairy	●Sumner	◆Washington
8	●Williamson	●Robertson	✚Henderson	●Rutherford	●Robertson
9	◆Washington	●Bedford	●Giles	●Williamson	●Wilson
10	●Robertson	●Lawrence	✚Gibson	●Giles	●Sumner
		✚ West	●Middle	◆East	

EXTENT OF PROBLEM

Tennessee's 1998, 303(d) List has identified 352 waterbodies that do not fully support all of their designated uses. Of this number, 133, or 38% of the total number of waterbodies are impaired by agricultural activities. The 1998 303(d) List has identified these activities by the use of the following terms:

Agriculture
Animal Feeding Areas
Animal Holding Areas
Concentrated Animal Feeding Operations
Crop Production

Non-Irrigated Crop Production
Pasture/Grazing
Pastureland
Specialty Crop Production

SOLUTIONS

1.1 AGRICULTURE

Water quality problems associated with agricultural operations are solved by the installation of appropriate best management practices (BMPs). Measurable water quality improvements are most likely to occur in smaller watersheds, where BMPs have been clustered together, or in a larger watershed where a large percentage of the landowners needing BMPs have had them installed. Additionally, programs that place tracts of land in long-term easements are very beneficial to the water quality of the watershed. In order to develop statewide strategies, an agricultural working group will be formed and will be comprised of representatives of the following list of partnering agencies and local groups. Interested citizens will also be encouraged to participate.

In the FY98 grant, the TDA-NPS Program began the Grant Pool project. This project focuses resources toward agricultural BMPs within 1998 303(d) listed watersheds. The goal of the grant pool project is to identify the causes of impairment within a watershed and install all BMPs necessary to fix the problems, so stream segments can be removed from the 1998 303(d) List.

The solution to problems associated with CAFOs is the NPDES permitting process, which requires all CAFOs of a certain size to obtain a permit. This permit requires that all CAFOs have a properly designed waste handling system and a nutrient management plan for their operation.

COOPERATING PARTNERS**Partners****Abbreviation**

Commodity Groups	
Livestock Associations	
State Soil Conservation Committee	SSCC
Soil Conservation Districts (all 95 counties)	SCD
Tennessee Association of Conservation Districts	TACD
Tennessee Department of Agriculture	TDA
Agricultural Resources Conservation Fund	-ARC
Tennessee Department of Environment and Conservation	TDEC
Division of Water Pollution Control	-WPC
Tennessee Resource Conservation and Development Councils	TNRC&D
Tennessee Farm Bureau	TFB
Tennessee Valley Authority	TVA
Tennessee Wildlife Resources Agency	TWRA
The Nature Conservancy	TNC
USDA - Natural Resources Conservation Service	NRCS
USDA - Farm Services Agency	FSA
University of Tennessee - Institute of Agriculture	UTIA

Commodity Groups

The producers of agricultural products, in addition to livestock, associate together in an effort to maximize efficiency and expand their businesses, and to promote agricultural awareness among the general public. These groups need to be targeted by the TDA-NPS Program as a gateway to producers. The following is a partial listing of these groups:

1.1 AGRICULTURE



Agricultural Production Association of Tennessee
Burley Stabilization Corporation
Feed and Grain Association of Tennessee
Fruit and Vegetable Growers Association of Tennessee
Nursery Association of Middle Tennessee
No-Till Farmers Association of West Tennessee
Nursery and Landscape Association Inc.
Soybean Promotion Board of Tennessee
Specialty Foods Association
Viticulture and Oenological Society of Tennessee

Livestock Associations

There are several organizations in Tennessee that livestock producers associate with that will be a target for educational efforts. These associations have members that own lands where BMPs could be needed. The following is a partial listing of these groups:

Beef Industry Council of Tennessee
Tennessee Cattlemen's Association
Dairy Products Association of Tennessee
Egg and Poultry Association of Tennessee
Forage and Grassland Council of Tennessee
Livestock Marketing Association of Tennessee
Pork Producers Association of Tennessee
Walking Horse Breeders and Exhibitors Association of Tennessee

TDA- Agricultural Resources Conservation Fund

This program supplies approximately \$3 million dollars annually to SCDs, RC&Ds and other organizations to cost-share with landowners on the installation of BMPs to eliminate sources of agricultural nonpoint source pollution. The source of the funds is a portion of the state's Real Estate Transfer Tax, with the controlling statute being TCA 67-4-409(l). Beginning with the FY2001 funding, each SCD has been encouraged to adopt a procedure in their respective district to evaluate the watersheds of the district, and to prioritize them so a "worst watershed first" approach to funding can begin. The current guidelines for fund usage are attached as Appendix A. Additionally, projects for informing and educating landowners, producers and managers of agricultural operations are also funded annually.

Tennessee Department Environment and Conservation – Division of Water Pollution Control (TDEC-WPC)

This agency administers the NPDES program in Tennessee, under the authority of The Water Quality Control Act, TCA 69-3-101 et seq. WPC has field staff located in eight regional environmental assistance centers that periodically respond to complaints which pertain to agricultural operations. Their focus is to determine if a point source of pollution is occurring at the site of the complaint. If the facility is a livestock operation, WPC and TDA have a Memorandum of Agreement established to solve these problems prior to the initiation of enforcement action. The goal is to educate the landowner about changes that need to be made in the operation to eliminate current problems and prevent future discharges.

1.1 AGRICULTURE



Additionally, WPC and TDA are cooperating to implement the provisions of the NPDES General Permit for CAFOs in Tennessee. TDA has approval authority for the waste handling system plans and the nutrient management plans for all CAFOs. WPC is the permitting authority.

Tennessee Valley Authority (TVA)

TVA is a wholly owned U.S. government corporation established by the TVA Act of 1933. TVA provides power to the Tennessee Valley by balancing the competing needs of power supply, flood control, navigation, land use, water quality, and recreation. They manage 480,000 acres of lakes, 11,000 miles of public shoreline, and 650 miles of navigable river, as the Nation's fifth-largest river system. TVA leases lands under their ownership to farmers for agricultural purposes. They also have established watershed teams to focus local efforts on improving the water quality of the Tennessee Valley. TVA staff regularly monitor ecological conditions of reservoirs and streams, in an effort to protect water quality without limiting the river system's use. Recent changes within the funding structure of TVA have permitted them to use their operating funds to match 319 funds.

Tennessee Wildlife Resources Agency (TWRA)

This agency is active in creating and restoring wildlife habitat across Tennessee. Projects that involve the restoration of riparian habitat can and often do include cooperating with farmers and rural landowners to establish buffer zones and other BMPs on agricultural lands.

USDA Farm Services Agency (FSA)

The Conservation Reserve Program (CRP) is administered by the FSA. The Natural Resources Conservation Service (NRCS) determines land and practice eligibility, ranks and scores offers based on environmental benefits, and develops the contract with the applicant. There have been 19 sign-ups to date, including three continuous sign-ups for "environmental" practices. In Tennessee, the environmental practices (1) grassed waterway; (2) shallow water for wildlife; (3) contour buffer strips; (4) filter strips; and (5) forested riparian buffer are automatically accepted into the program when determined to be eligible. All other practices are standard, and applicants must compete to be accepted into the program. A summary of enrollment from 1986 through program year 1999 for Tennessee is listed below:

Total acres currently enrolled in CRP 255,320

Total cropped wetland acres enrolled 4,846

Total acres enrolled under scour erosion 782

Summary by Practice:

Total acres established to INTRODUCED GRASSES (CP1) 88,603

Total acres established to NATIVE GRASSES (CP2) 1,338

Total acres established to TREES (CP3) 11,236

Total acres established to PERMANENT WILDLIFE COVER (CP4) 5,029 •

Total acres established to GRASS WATERWAYS (CP8A) 53 •

Total acres established to WILDLIFE WATER (CP9) 61

Total acres of PREVIOUSLY ESTABLISHED GRASS (CP10) 123,166

1.1 AGRICULTURE



Total acres of PREVIOUSLY ESTABLISHED TREES (CP11) 12,288 •
Total acres established to FOOD PLOTS (CP12) 93 •
Total acres established to FILTER STRIPS (CP13 or CP21) 9,287
Total acres established to WETLAND TREES (CP14) 4,056
Total acres established to FORESTED RIPARIAN BUFFERS (CP22) 136

USDA Natural Resource Conservation Service (NRCS)

NRCS is the largest conservation agency in Tennessee. They manage many programs to assist landowners with the task of improving their operations to protect the quality of Tennessee waters. The following is a listing of their conservation programs.

Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP) was established in the 1996 Farm Bill as a voluntary conservation program for farmers and ranchers to achieve the maximum environmental benefits per dollar expended. EQIP provides technical, financial, and educational assistance for locally identified conservation priority areas (CPAs) and natural resource concerns. Sixty-five (65) percent of EQIP funds are targeted to conservation priority areas, and thirty-five (35) percent are used to address the natural resource concerns. The USDA/Natural Resources Conservation Service administers and provides technical assistance for the EQIP.

CPAs are developed at the local level by local workgroups. CPAs may be watersheds, subwatersheds, regions, or areas of special environmental sensitivity or significant soil, water, or related natural resource concerns. During fiscal years 1997-2000, Tennessee will have funded a total of 16 different EQIP CPAs, with sizes ranging from 23,000 acres to 2,000,000 acres.

Natural resource concerns for EQIP in Tennessee include water quality, agricultural waste management, soil sustainability, grazing land, wildlife habitat, and wetlands. The NRCS State Conservationist approves CPAs and natural resource concerns based on recommendations of the State Technical Committee.

Contracts developed for EQIP are for five to ten years in length. Financial assistance can be provided for up to 75 percent of the cost of applying approved conservation practices. A brief summary of EQIP in Tennessee is listed below.

In 1997, Tennessee had six CPAs and 550 EQIP contracts. Approximately 23 of the contracts addressed waste management systems. In 1998, Tennessee had six CPAs (four existing CPAs from 1997 plus two new CPAs) and 454 EQIP contracts. Forty-three (43) contracts were for waste management systems. In 1999, Tennessee funded two new CPAs and six existing CPAs, for a total of eight CPAs and 350 EQIP contracts. More than 30 contracts addressed waste management systems. Six new CPAs and three existing CPAs are approved for fiscal year 2000. The three-year total for EQIP contracts is 1,354, with nearly 100 contracts addressing waste management systems. Going into EQIP's fourth year of operation, a total of 16 CPAs have been funded in Tennessee. The following is a breakdown of locations by Tennessee NRCS administrative divisions:

1.1 AGRICULTURE

WEST TENNESSEE	MIDDLE TENNESSEE	EAST TENNESSEE
Wolf	Lower Cumberland/Red	Upper Cumberland
Loosahatchie		Nolichucky
Hatchie	Duck	Hiwassee-Ocoee-
Forked Deer	Elk-Shoal	Conasauga
Obion	Upper Harpeth	Beaver Creek
	Round Lick Creek	Pond Creek
	Collins/Rocky	Sequatchie

The Conservation Buffer Initiative

In April 1997, the USDA launched the National Conservation Buffer Initiative under the leadership of the NRCS. With this initiative, USDA has pledged to help landowners install 2 million miles of conservation buffers by the year 2002. Conservation buffers are a common-sense way to protect water quality. Buffers simply are small areas or strips of land in permanent vegetation, designed to intercept pollutants and manage other environmental concerns. These areas protect soil, improve air and water quality, enhance fish and wildlife habitat, conserve biodiversity, and beautify the landscape. Types of buffers used in Tennessee include riparian forest buffers, filter strips, grassed waterways, contour grass strips, field borders, alley cropping, and shallow water areas for wildlife.

The Core 4 Program

Core 4 is a new program of NRCS, where emphasis is placed on installing 4 key BMPs, which are conservation tillage, conservation buffers, nutrient management, and pest management.

Grazing Lands Conservation Initiative

The Grazing Lands Conservation Initiative (GLCI) in Tennessee is a program to enhance grazing lands while improving the environment and economy. In FY 2000, the NRCS and partners planned six demonstration farms in Tennessee. The Tennessee Agriculture Extension Service assisted with planning assistance, and the Tennessee Department of Agriculture assisted with financial assistance. These farms are used to demonstrate rotational grazing, weed management, pasture utilization, fencing techniques, windbreak technology, and alternative water sources. The farms are located in the following counties: Chester, Franklin, Greene, Jefferson, and Wilson.

Conservation Technical Assistance Program (CTAP)

The CTAP is the basis of the NRCS mission to conserve, sustain, and improve Tennessee's private lands. NRCS staff work with individual landowners, communities, conservation districts, units of state and local governments, and other partners to meet their goals for resource stewardship and assisting individuals to comply with state and local requirements. The purpose of the CTAP is to assist interested individuals and units of governments in planning and implementing conservation systems. These systems reduce erosion, improve soil and water quality, improve and conserve wetlands, enhance fish and wildlife

1.1 AGRICULTURE



habitat, improve air quality, improve pasture and hayland conditions, reduce flooding, and improve woodlands.

The major objectives of the CTAP are to:

Assist agricultural producers to comply with the highly erodible land (HEL) and wetland (Swampbuster) provisions of the 1985 Food Security Act as amended by the Food, Agriculture, Conservation and Trade Act of 1990, the Federal Agriculture Improvement and Reform Act of 1996, and wetlands requirements of Section 404 of the Clean Water Act.

Provide technical assistance to participants in USDA cost share and conservation incentives programs.

Collect, analyze, interpret, display, and disseminate information about the condition and trends of Tennessee's soil and other natural resources so that people can make good decisions about resource use and public policies for resource conservation.

Watershed and River Basin Planning and Installation Public Law 83-566 (PL566)

Technical and financial assistance is provided in cooperation with local sponsoring organizations, state, and other public agencies to voluntarily plan and install watershed-based projects on private lands. The program empowers local people or decision-makers, builds partnerships, and requires local and state funding contributions. The purposes of watershed projects include watershed protection, flood prevention, water quality improvements, soil erosion reduction, rural, municipal and industrial water supply, irrigation water management, sedimentation control, fish and wildlife habitat enhancement, and create and restore wetlands and wetland functions.

Wildlife Habitat Incentives Program (WHIP)

WHIP is a voluntary program for landowners that want to develop and improve wildlife on private lands. Technical and cost-sharing assistance is available to help establish and improve fish and wildlife habitat.

WHIP's goals specific for Tennessee are to restore or enhance critical upland and wetland wildlife habitat, habitat for threatened and endangered species, and riparian habitats beneficial to fish and aquatic species.

Special emphasis is placed on improving native grassland and early successional shrub habitats across the state. The establishment of native warm season grasses, riparian buffers, and field borders are the most common practices being applied through WHIP.

Tennessee WHIP funds have been used to restore over 8,000 acres of native warm season grasses, 200 acres of riparian buffers, 70 acres of wetlands, and over 3,000 acres benefiting threatened and endangered species.

1.1 AGRICULTURE



During the two-year pilot of the Wildlife Habitat Incentives Program, 250 Tennessee landowners enrolled 10,600 acres of private land and received over \$850,000 for wildlife habitat restoration and enhancement. Over 95 percent of the enrollees opted for the maximum ten-year contract period.

University of Tennessee, Institute of Agriculture (UTIA)

The College of Agricultural Sciences and Natural Resources, the Agricultural Experiment Station, and the Agricultural Extension Service, including Ag and Biosystems Engineering, collectively known as the Institute of Agriculture, provide instruction, research, and public service in agriculture and related areas to students, producers, and consumers in Tennessee and secondarily to the region, nation, and world. The Institute contributes to improving the quality of life, increasing agricultural productivity and income, protecting the environment, promoting the economic well-being of families, and conserving natural resources for all Tennesseans. The clientele served includes students, farmers, homemakers, 4-H and other youth, agribusiness, state and federal governmental agencies, consumers, and the general public.

Agricultural Experiment Stations

The Experiment Station exists to develop technology which will enhance the efficiency of agricultural, forest and ornamental industries, improve quality of rural life, and conserve rural environmental resources of soil, water, air, and wildlife. This is accomplished by active research programs conducted by approximately 130 faculty members attached to eight departments on the Institute of Agriculture Campus and in two departments in the College of Human Ecology. In addition to the campus-based programs, eleven experimental farms called Branch Experiment Stations located in three grand divisions of the state are utilized, as shown on the following map.



Agricultural Extension Service

These programs are oriented toward improving the profitability and sustainability of Tennessee agriculture, emphasizing the efficient use of natural resources, improving the management and therefore the profitability of the state's forest resources, teaching waste management practices to protect the environment, improving water quality in homes and on farms, and training producers to improve farm management and combine production management and marketing into a complete plan to improve profitability of Tennessee agriculture.

Agriculture and Biosystems Engineering

Biosystems engineers are also responsible for technologies that improve the quality of rural life. They assist producers with environmental enhancement and

1.1 AGRICULTURE



natural resource preservation, such as identifying sources of water contamination and ways individual producers can maintain or restore the quality of the water that they and their animals drink or that they apply to their crops. Rural and urban communities also benefit from such water quality improvements. Waste reduction and utilization are other biosystems engineering concerns, as are soil erosion, pesticide application, wetlands preservation, on-site sewage treatment, and other topics not always directly associated with agriculture. By improving the efficiency of production systems and the quality of rural life, UT biosystems engineers positively impact the lives of all Tennesseans as well as folks in the surrounding region and throughout the country.

Tennessee Farm Bureau

Farm Bureau membership is represented on numerous water quality committees and task force assignments during the year. The Public Affairs Department provides assistance to the agriculture representatives on these committees. In some cases a staff person actually serves on the committee. These special committees are designed to solve problems or improve conditions in our state. Examples of committees include:

1.1 AGRICULTURE

Air Pollution Control Board	319 Nonpoint Source Management Group Solid Waste Disposal Control Board
Council for Excellence in Higher Education	Source Water Assessment Program Committee
Governor's Interagency Wetlands Committee and Technical Working Group	Tennessee Municipal Solid Waste Advisory Panel
Greenbelt Advisory Committee	Water Quality Control Board
Natural Resources Conservation Service Technical Advisory Committee	West Tennessee River Basin Authority

Policy Development

A state resolutions committee consisting of county presidents, women's committee chairmen and state board members annually review Farm Bureau policy and analyze it recommending policy changes based on issues discussed at the county and district level. The final step requires approval from the delegate body during the Tennessee Farm Bureau Annual Meeting. The policy is then utilized by the Tennessee Farm Bureau as the organization voices the farmer's concerns at the local, state and national level.

Policy Implementation

At the state level each County Farm Bureau selects a State Legislative Committee. Members receive the Legislative Alert on a weekly basis while the Tennessee General Assembly is in session. Committee members make contacts with state legislators on priority agriculture issues.

Tennessee Association of Conservation Districts (TACD)

TACD was organized to advance the programs of the Soil Conservation Districts and promote the welfare of the people of Tennessee through the work of Conservation Districts. TACD encourages maximum cooperation between Districts and agencies of local, state and federal government in the development and conservation of renewable natural resources. TACD also encourages cooperation among Districts, individuals and various government agencies interested in resource development, which promotes an educational and informational program of soil and water conservation and watershed/flood prevention.

The Nature Conservancy (TNC)

Through the Chattanooga-based Southern Appalachian Rivers Initiative, TNC is working with farmers and other landowners to prevent pollution of the Clinch, Powell, Watauga, and Conasauga Rivers, which contain North America's highest concentration of endangered fresh water mussels and fish. In middle Tennessee, the Conservancy is working to protect the Duck and the upper Harpeth Rivers. In west Tennessee, the Wolf and Hatchie Rivers, as well as the Mississippi River itself, are the focus of Conservancy efforts.

Soil Conservation Districts (SCDs)

1.1 AGRICULTURE

Each of Tennessee's 95 counties has a Soil Conservation District Board of Supervisors, organized under the authority of TCA 43-14-201 et seq. Each board is comprised of five members, three elected members and two appointed members. The mission of the SCD board is to investigate the causes and effects of soil erosion in their district and seek cooperative relationships with other agencies and programs to eliminate all soil erosion in the district. The State Soil Conservation Committee gives guidance to the 95 districts. All technical assistance for BMP implementation is provided by the USDA-NRCS personnel in each District.

State Soil Conservation Committee (SSCC)

This committee is established under the authority of TCA 43-14-203 et seq., and consists of seven (7) members. The functions and responsibilities of the SSCC are to approve the appointments of board members to each SCD board, to offer assistance to the SCDs in carrying out their programs, to keep the SCDs organized and to facilitate the exchange of information between the SCDs, and to secure the cooperation of federal programs. Additionally, the SSCC approves the formation of watershed districts in Tennessee.

Other Funding Sources**TDEC-Division of Community Assistance (DCA)**

The State Revolving Fund (SRF) is managed by TDEC-DCA. This agency has expressed the desire to expand its funding to nonpoint source projects. Several meetings have been held between the SRF Program, WPC, and TDA-NPS Program to discuss directing SRF funding towards nps issues. The possibility exists to begin to provide a loan program to landowners for the installation of certain BMPs.

County and City Governments

Based on proposed rules of the EPA, the trading of point and nonpoint sources may become a reality in the near future. In this event, city and county governments that own point sources on 1998 303(d) listed waters may determine that a correction of the nonpoint source problems in the watershed is more cost effective than the addition of advanced treatment technology. This process is likely to involve the installation of BMPs on agricultural lands, and could be an additional source of revenue.

Additional funding sources for environmental projects are listed in the Catalog of Federal Funding, which can be found at: www.aspe.os.dhhs.gov/cfda



CURRENT 319 PROJECTS

The following is a list of current and proposed 319 projects for Agriculture.

Grant Yr.	Project Title	Location
FY-93	Clinch Powell RC&D	Hancock Co.
FY-95	Nolichucky River/Bent Creek	NE TN
	Farm*A*Syst/Home*A*Syst	Statewide
FY-96	Upper Clinch River	Hancock Co.
	Big South Fork- Clear Fork	Fentress Co.
	Forked Deer- Stokes Creek	Crockett Co.
	Pesticide Storage and Collection	Statewide
	Red River- Sulphur Fork Creek	Robertson Co.
FY-97	Collins River- Caney Fork Heavy Use Areas	Middle TN
	Wetlands for Pesticide Control	Middle TN
FY-98	Farm*A*Syst/Home*A*Syst CD Rom	Statewide
	Pesticide Collection Program	Statewide
	Grant Pool	Statewide
FY-99	Grant Pool	Statewide
FY-99UWA	Clinch River Swan Island/Briar Creek	Hancock Co.
	Red River-Sulphur Fork Creek	Robertson Co.
	Little River- Ellejoy Creek	Blount Co.

AREAS FOR PROGRAM EXPANSION

Development of an Agriculture Working Group. As reflected in the milestones of this chapter, TDA-NPS Program will seek to facilitate a series of meetings with all agencies listed above and any concerned citizen to begin to develop a water quality strategy for agriculture in Tennessee.

Emphasis on CORE 4. TDA-NPS Program will cooperate with NRCS in their efforts to establish nutrient management, pest management, buffers and conservation tillage practices on all farms where needed.

Begin CREP Program. Work with USDA-FSA to establish a Conservation Reserve Enhancement Program in Tennessee.

Producer and Commodity Group Participation. TDA-NPS Program will work to enlarge the partnership base by seeking to involve all agriculture commodity and livestock producer groups in Tennessee.



WATER QUALITY MONITORING & ASSESSMENT

319 funding has been granted to TDEC-WPC for statewide monitoring efforts, in support of their five-year, rotational watershed monitoring approach. All waterbodies in Tennessee will be assessed through this continuous program, which will result in more precise information about what stream segments are impaired and where they are located. This will result in an increase in efficiency of TDA's grant programs.

319 funding has also been given to TDEC-WPC for monitoring efforts in the 11 UWA watersheds. This funding will provide pre- and post-BMP monitoring, so the effectiveness of BMP installations can be measured in terms of water quality improvements.

ENFORCEMENT MECHANISMS

Concentrated Animal Feeding Operations (CAFOs). In 1998, TDEC and TDA issued a Strategy for Animal Feeding Operations. In this strategy, a process was created for permitting certain CAFOs, either with an individual NPDES permit, or through a general permit. This permitting system allows for enforcement action to be taken if the provisions of the permit are violated, through the authority of TCA 69-3-101 et seq. The Strategy and associated permits include requirements that all new or expanding facilities be designed and operated so that there is no discharge to waters of the state.

TDA and TDEC have in place a Memorandum of Agreement (MOA) concerning agricultural related complaint processing. This MOA states that if a complaint is received by TDEC personnel, then, prior to initiating an enforcement action, TDEC personnel contact TDA. A site visit is made by the appropriate Regional Administrator, who contacts the land owner with the problem, and seeks to convince the landowner to voluntarily participate in the TDA cost-share programs. This action will correct any problems that may exist and make any enforcement action by TDEC unnecessary.

MEASURES OF SUCCESS

- The Agricultural Working Group will meet at least semiannually to formulate the state's water quality strategy.
- BMPs funded through TDA programs, as required, will be installed in watersheds that are on the 303(d) List, with the intention of removing waters from the List, or
- BMPs funded through TDA programs will be installed in watersheds to eliminate pollution sources on waterbodies not yet listed, to prevent them from ever being included on the 303(d) List.



MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, strengthen existing partnerships and to foster greater trust, commitment and accountability.

- **Action 1:** The Agriculture Working Group (AWG) will meet semi-annually.
Lead: TDA-NPS Program
Key partners: TDEC-WPC; TNRC&D; USDA-NRCS; USDA-FSA; UTIA; SCDs; SSSC; TACD; TNRC&D; TDEC-WPC; TFB
Year(s): 2001-2005
- **Action 2:** Increase AWG membership by one member each year.
Lead: TDA-NPS Program
Key partners: TDEC-WPC; TNRC&D; USDA-NRCS; USDA-FSA; UTIA; SCDs; SSSC; TACD; TNRC&D; TDEC-WPC; TFB
Year(s): 2001-2005
- **Action 3:** Establish the AWG mission statement, a list of collective capabilities, and priorities for funding.
Lead Agencies: AWG and TDA-NPS Program
Year(s): 2001-2005
- **Action 4:** Seek to develop a interagency water quality strategy for Tennessee Agriculture
Lead: TDA; USDA-NRCS; USDA-FSA; UTIA; TFB
Key Partners: SCDs; SSSC; TACD; TNRC&D; TDEC-WPC
Year(s): By 2005
- **Action 5:** Consider a system of certification for third party animal waste haulers in Tennessee.
Lead: TDEC-WPC and TDA-NPS Program
Key Partners: USDA-NRCS; TFB; UTIA; TACD; TCL; Egg and Poultry Board
Year(s): 2001
- **Action 6:** Form an advisory team from poultry growers, integrators and agricultural agencies.
Lead Agency: TDA-NPS Program
Key Partners: Egg and Poultry Board; UTIA; USDA-NRCS; TDEC-SWM
Year: 2000

1.1 AGRICULTURE



- **Action 7:** Develop information concerning the economy of large scale composting as a value-added residual product.

Lead Agency: AWG
Key Partners: Egg and Poultry Board; TDEC-SWM
Year: 2001
- **Action 8:** If feasible, seek funding sources for construction of composting facility (as mentioned in Action 7).

Lead Agency: TDA-NPS Program
Key Partners: Egg and Poultry Board; UTIA; USDA-NRCS; TDEC-SWM
Year: 2002
- **Action 9:** Meet with TDEC-DCA to determine feasibility of establishing a loan fund for BMPs.

Lead: TDA-NPS Program, TDEC-DCA
Key Partners:
Year: 2000
- **Action 10:** If feasible, establish the loan fund with a portion of the State Revolving Fund

Lead: TDEC-DCA
Key Partners:
Year: 2001
- **Action 11:** Make all landowners aware of the loan program, if established.

Lead: TDA-NPS Program
Key Partners: TDEC-DCA
Year(s): 2001
- **Action 12:** Determine all sources of funding available for landowners

Lead: TDA-NPS Program
Key Partners: AWG
Year: 2001-2005
- **Action 13:** Develop Memoranda of Agreement with key federal agencies to improve programmatic consistency.

Lead: TDA-NPS Program
Key Partners: All federal agency partners
Year(s): 2001-2005

Long Term Goal 2.

Fully implement all developed TMDLs for nonpoint sources in compliance with existing regulations, policies, or agreements by 2015.

Refer to Chapter 1.11, TMDL Implementation for specific action items related to this Long Term Goal.

1.1 AGRICULTURE



Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- **Action 1:** Install BMPs so that 20% of the streams impaired due to agriculture on the 1998 303(d) List will support their designated uses.
Lead: TDEC-WPC; TDA; USDA
Key partners: SCDs; TACD; TNRC&D; TVA; UTIA; Local government
Year(s): 2005
- **Action 2:** Install BMPs so that 60% of the streams impaired due to agriculture on the 1998 303(d) List will support their designated uses.
Lead: TDEC-WPC; TDA; USDA
Key partners: SCDs; TACD; TNRC&D; TVA; UTIA; Local government
Year(s): 2010

Long Term Goal 4.

Beginning in 2006, through regulatory and non-regulatory means, prevent previously unlisted waters from being included on the 303(d) List because of nonpoint source impairments.

- **Action 1:** Implement BMPs on streams not listed on the 1998 303(d) List
Lead: TDA-NPS Program
Key partners: UTIA; TNRC&D; Local government; TDA-ARC; SCDs; USDA-NRCS
Year(s): 2001-2005
- **Action 2:** Gather information from existing CREP state programs
Lead Agency: TDA-NPS Program
Key Partners: USDA-FSA; USDA-NRCS
Year: 2001
- **Action 3:** Establish required match funding for CREP
Lead Agency: TDANPS
Key Partners: USDA-FSA; USDA-NRCS
Year: 2001
- **Action 4:** Develop Tennessee CREP policies, if necessary
Lead : TDA-NPS Program
Key Partners: USDA-FSA; USDA-NRCS; TDA; USDA-FSA
Year: 2002
- **Action 5:** Finalize CREP Agreement
Lead: TDA-NPS Program
Key Partners: USDA-FSA; USDA-NRCS; TDA; USDA-FSA
Year: 2002

1.1 AGRICULTURE



- **Action 6:** Develop and distribute information to landowners and citizens about the CREP program in Tennessee.
Lead: TDA-NPS Program
Key Partners: USDA-FSA; USDA-NRCS; TDA; USDA-FSA
Year: 2003
- **Action 7:** All new and expanding CAFO operations shall comply with state permit provisions, as required.
Lead: TDA-NPS program
Key Partners: TDEC-WPC, USDA-NRCS, UTIA
Year(s): 2001

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution, and how to prevent it.

- **Action 1:** Develop and distribute educational material concerning Agriculture issues in increasing amounts each year.
Lead: TDA-NPS Program
Key partners: AWG
Year(s): 2001-2005
- **Action 2:** Provide funding to agriculture related demonstration projects annually.
Lead: TDA-NPS Program
Key partners: AWG
Year(s): 2001-2005
- **Action 3:** Provide educational information concerning Agriculture on the TDA-NPS web page.
Lead: TDA-NPS
Year(s): 2001
- **Action 4:** Perform a review of all existing publications, and update them as necessary
Lead: TDA-NPS Program
Key Partners: USDA-NRCS; USDA-FSA; TVA; UTIA; TACD; Universities; Local government
Year(s): 2000-2002
- **Action 5:** Continually fund the creation of relevant and high quality informational materials to emphasize the importance of preventing and eliminating nonpoint pollution.
Lead: TDA-NPS Programs
Key Partners: USDA-NRCS; USDA-FSA; TVA; UTIA; TACD; Universities; Local government
Year(s): 2000-2015 and beyond

1.1 AGRICULTURE



- **Action 6:** Seek to develop projects to distribute, create, or adapt informational materials addressing the proper design, operation and site selection of animal waste facilities.

Lead: TDA-NPS Programs

Key Partners: USDA-NRCS; USDA-FSA; TVA; UTIA; TACD; Universities; Local government

Year(s): 2000-2005
- **Action 7:** Use the TDA-NPS Program web page to make all publications and other agricultural nonpoint pollution related information widely available to all interested persons.

Lead: TDA-NPS Program

Key Partners: USDA-NRCS; USDA-FSA; TVA; UTIA; TACD; Universities; Local government

Year(s): 2000-2005

Long Term Goal 6.

Through the process of continuous improvement, routinely assess all programmatic functions of the TDA-NPS Program in order to maximize efficiency, decrease the bureaucratic burden and increase the numbers of participants in the program.

- **Action 1:** Investigate other funding sources such as The Nature Conservancy, Brownfields Program, as well as EPA.

Lead: TDA-NPS Program

Key partners: The Nature Conservancy; US EPA

Year(s): 2001-2005
- **Action 2:** Provide responses to all project related inquiries from grantees within three business days of the request.

Lead: TDA-NPS Program

Year(s): 2001-2005
- **Action 3:** Work with grantees to achieve timely submittal of all progress reports 100% of the time.

Lead: TDA-NPS Program

Year(s): 2001-2005
- **Action 4:** Develop a Priority Ranking System for project review.

Lead: TDA-NPS Program

Key Partner: URWG

Year(s): 2001-2005
- **Action 5:** Request feedback from partners annually to assess the quality of the services provided by the TDA-NPS Program.

Lead: TDA-NPS Program

Year(s): 2001-2005
- **Action 6:** Fund at least five demonstration projects annually which will inform

1.1 AGRICULTURE



agricultural producers about how to eliminate or prevent polluted runoff from their operations.

Lead: TDA-NPS Program

Key Partners: SCD; UTIA; TVA; USDA-NRCS

Year(s): 2000-2015 and beyond

Long Term Goal 7

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

See Chapter 1.9 for action items related to water quality monitoring for the TDA-NPS Program.

INTRODUCTION



This chapter conveys the local, state, and federal agency, as well as the private sector commitment to protect and improve the quality of surface and ground water impaired by construction activities. It will focus on the following construction activities: land disturbing activities; road, bridge, and culvert construction activities; and utility line construction and maintenance. The objective of the Construction Working Group is to stimulate environmental awareness by supporting projects to design, demonstrate, or disseminate methods and techniques to

reduce and abate construction nonpoint source pollution.

EXTENT OF PROBLEM

Erosion from unprotected soil, and siltation from land disturbing activities such as residential, commercial, and industrial construction, road, bridge, and culvert construction are major contributors of nps pollution. Construction activities impact streams and lakes by impairing their designated uses. According to the 1998, 303(d) List, 341.1 miles of streams are partially supporting and 30.3 miles are not supporting. Documented construction impacts to Tennessee's lakes are minor, with 7 acres not supporting their designated uses. The most common effects of construction on the waters of the state are siltation and habitat alteration. Construction activities convert farmlands and forested areas into roads, housing developments, and shopping centers. When this occurs in a given watershed, the amount of impervious surface area of the watershed greatly increases. This means that when it rains, there is less land area available for the rain to soak into, so runoff increases. For any given rainfall event, the quantity and speed of the water running to streams dramatically increases. This can result in flooding and streambank erosion, as well as increased sediment transport. Water quality to support drinking water supplies, recreation, and fish and aquatic life receive the greatest impacts from increase impervious area due to construction activities, according to the 1998, 305(b) Report.

The efforts in Tennessee have been focused upon the installation of BMPs, and training of professionals to utilize BMPs in large-scale operations. While some overlap exists between this chapter and the hydrologic modification and urban runoff chapter, it is important to include those items as they pertain to construction. Other problems include dust generation and its deposition on roadways and highways near construction sites.

Sediment is the most common form of pollution washed from work sites, creating multiple problems once it leaves the site. Sediment not only harms fish and aquatic life, but also can increase the risk of flooding by blocking storm drains and gutters. Sediment also can carry with it pollutants from construction sites. The obvious solution is to stop or reduce runoff contamination from the construction site before it begins. Very few

1.2 CONSTRUCTION

construction problems have only one solution. Most sites need a number of Best Management Practices (BMPs) applied to them. These combination BMPs are often the most effective. Other solutions include educating the public, as well as training the construction contractor.

1998 303(d) list with Construction as a pollutant source

Waterbody ID	Impacted Waterbody
Upper Cumberland River	

TN05130201041	East Camp Cr
TN05130106007	Roaring River

Lower Cumberland River

TN05130202007	Mill Creek
TN05130204001	Harpeth River
TN05130204002	Jones Creek

Holston River Basin

TN06010104001	Holston River
---------------	---------------

Upper Tennessee River Basin

TN06010201TURKEYCR	Turkey Creek
--------------------	--------------

Lower Tennessee River Basin

TN06020001007	S. Chickamauga Cr
---------------	-------------------

Western Tennessee Basin

TN06040001072	Hardin Creek
---------------	--------------

Hatchie River Basin

TN08010208027	Piney Creek
---------------	-------------

Mississippi River Basin

TN08010100002	Mc Kellar Lake
---------------	----------------

SOLUTIONS

BMPs for Construction-Land Disturbing Activities

- | | |
|-------------------------------------|-----------------------------------------------------------|
| 1. Staked Hay Bales | 10. Stabilization with Erosion Control Fabric and Netting |
| 2. Silt Fences | 11. Bank Stabilization |
| 3. Buffer Strips | 12. Temporary Gravel Construction |
| 4. Sediment Structures | 13. Construction Road Stabilization |
| 5. Brush Barriers | 14. Storm Drain Inlet Protection |
| 6. Clearing and Grubbing Constraint | 15. Temporary Diversion Dike |
| 7. Temporary Berms | 16. Temporary Fill Diversion |
| 8. Temporary Seeding | 17. Diversion |
| 9. Sodding | |

BMPs for Road, Bridge, and Culvert Construction – Land Disturbing Activities

- | | |
|-------------------------------------|----------------------------------------|
| 1. Staked Hay Bales and Silt Fences | 10. Waterspreading |
| 2. Buffer Strips | 11. Waterways |
| 3. Sediment Structures | 12. Temporary Stream Crossings |
| 4. Check Dams | 13. Nonerodible Cofferdams |
| 5. Brush barriers | 14. Prohibition of Construction Debris |
| 6. Clearing and Grubbing Constraint | 15. Channel Modification |
| 7. Temporary Berms | 16. Sodding |
| 8. Temporary Slope Drains | 17. Bank Stabilization |
| 9. Temporary Seeding | 18. Temporary Diversion |

BMPs for Electric Line Construction and Maintenance

- | | |
|-------------------------------------------|-------------------------|
| 1. Access Road Measures | 4. Vegetative Controls |
| 2. Right of Way Clearing and Construction | 5. Good Housekeeping |
| 3. Structure Controls | 6. Herbicide Use |
| | 7. Stormwater Discharge |

Governmental Services/Regulations/Programs

1. Slope and gully stabilization programs
2. Planting programs – green belts, vegetative buffers, streamside management zones
3. Regulation of the application of fertilizers, and, pesticides
4. Effective zoning to encourage proper land use
5. Effective building codes and enforcement which require:
 - Optimum conservation practices during construction
 - Post-construction runoff characteristics no greater than pre-construction conditions
 - Contractor awareness of and proficiency in using conservation practices
 - Education and information program efforts to increase public awareness of conservation practices.

1.2 CONSTRUCTION**Urban Sprawl**

Tennessee has made a large step toward addressing urban sprawl in the state. The 1998 Public Law 1101 indirectly effects water quality by requiring cities and counties to develop 20-year growth plans. The deadline set by the General Assembly for completing and approving the plans is July 1, 2001. The need to balance opportunities for economic development with an increasingly heavy burden on infrastructure and services has characterized the plans in many areas.

Tennessee Erosion Control Training Program

TDEC-WPC, partnering with UTCIS, UTRRC, TDOT, Metropolitan Davidson County, City of Chattanooga, and TDANPS, is developing an erosion control training program. TDEC-WPC has contracted with UTCIS and UTRRC to develop the materials for the training program. An associated video is being produced by UTCIS with 319 financial support. The program will develop two certifications: a Specialist I who will be trained to apply and maintain an erosion control plan, and a Specialist II who will be trained, along with other expertise, to develop and supervise erosion plans development. Training for this voluntary program is scheduled to begin in the summer of 2000, at four sites across the state.

COOPERATING PARTNERS**Partners**

Associated Builders and Contractors
 City of Chattanooga
 Environmental Protection Agency
 Federal Highway Administration
 Home Builders Association of Tennessee
 Tennessee American Planning Association
 Tennessee Association of Conservation Districts
 Tennessee Contractors Association
 Tennessee County Services Association
 Tennessee Department of Agriculture
 Ag Resource Conservation Fund
 Tennessee Department of Economic and Community Development:
 Office of Local Planning
 Tennessee Department of Environment and Conservation
 Division of Water Pollution Control
 Tennessee Department of Transportation
 Tennessee Housing Development Authority
 Tennessee Municipal League
 Tennessee Resource Conservation and Development Council
 Tennessee Association of Utility District
 Tennessee Valley Authority
 United States Army Corps of Engineers
 United States Coast Guard
 University of Tennessee Institute of Agricultural
 University of Tennessee
 Civil & Environmental Engineering Department

Abbreviation

ABC
 COC
 EPA
 FHWA
 HBAT
 TAPA
 TACD
 TCA
 TCSA
 TDA
 ARC
 TDECD

 TDEC
 WPC
 TDOT
 THDA
 TML
 TNRC&D
 TAUD
 TVA
 USACE
 USCG
 UTIA
 UT
 UTCEED

1.2 CONSTRUCTION



Tennessee Water Resources Research Center
University of Tennessee Center for Industrial Services
USDA
Natural Resources Conservation Service
Farm Services Agency
UT County Technical Assistance Service
UT Municipal Technical Advisory Service

UTWRRRC
UTCIS
USDA
NRCS
CFSA
CTAS
MTAS

Several agencies have programs to control nps pollution resulting from construction activities. These agencies include USACE, TVA, TDOT, and TDEC. The following discussion describes the responsibilities and programs of each of these agencies.

Home Builders Association of Tennessee (HBAT)

The Home Builders Association of Tennessee is a not-for-profit trade association comprised of professional builders, developers, and associated firms engaged directly or indirectly in home building, remodeling, and light commercial construction. Educate our members and encourage excellence in construction.

Tennessee Department of Economic and Community Development (TECD)

TECD assists existing firms and recruits new development, as well as assisting communities to capitalize on economic development opportunities. Through its regional local planning assistance offices, it also provides land use regulation and planning assistance to municipalities and counties on a contract basis. The Local Planning Assistance Office Internet site is <http://www.state.tn.us/ecd/locplan.htm>

UT County Technical Assistance Service (CTAS)

To promote better county government through the provision of direct assistance to county officials in developing and implementing ideas and methods for improving service to citizens within the legal framework of the Tennessee Constitution and laws enacted by the Tennessee General Assembly

UT Contractor Resource Center (CRC)

The UT CRC provides a wide range of assistance for small businesses that are certified by the Tennessee Department of Transportation (TDOT). The CRC has staff consultants that travel to company offices or work sites anywhere in the state of Tennessee providing one-on-one consultation. Services include technical, information technology and business management assistance and formal classroom training and workshops.

Tennessee Resource Conservation and Development Councils (TNRC&D)

The Resource Conservation and Development (RC& D) program provides technical assistance to local communities (multi-county areas known as "RC&D areas") to improve their economies, natural resources, and living standards by coordinating conservation and rural development assistance available from USDA, other federal, state, and local sources.

1.2 CONSTRUCTION



Tennessee Utility District Association (TAUD)

TAUD serves over 500 utilities and businesses in the state of Tennessee. Their staff of water, wastewater, and cross connection experts is available to assist and answer questions. On-site technical assistance is available at city and county utilities by TAUD staff, specializing in water and wastewater operations.

Tennessee Housing Development Authority (THDA)

The Municipal Technical Advisory Service (MTAS)

Purpose: Help Tennessee cities be the best they can be.

Mission: To meet the challenge of providing timely, valuable information and assistance to Tennessee cities to build better communities.

MTAS is a technical assistance provider with consultants who specialize in most areas of municipal operations. The Tennessee Municipal League, the lobbying arm for the state's cities and towns, turned to the General Assembly and asked for technical help for its members. The league wanted that help to be independent of politics. The result was MTAS, now an agency of The University of Tennessee's [Institute for Public Service](#). MTAS is funded by a direct state appropriation and a portion of the local share of the state wide sales tax. MTAS annually completes more than 1,000 municipal management projects and averages about 13,000 other services each year. The MTAS Library is the most comprehensive collection of municipal government related information in Tennessee and one of the most extensive municipal research centers in the country. Services provided by the staff of this library are also available to all Tennessee city officials at no charge. Library services available to Tennessee city officials include reference and research services, database searches, information and referral services and individual surveys of cities to gain information of specific interest.

United States Army Corps of Engineers (USACE)

The USACE regulates activities in navigable waters of the U.S. under the Rivers and Harbors Act of 1899 (RHA). The Act prohibits the unauthorized obstruction or alteration of any navigable water of the U.S.

All work performed on, over, or under navigable waters requires review and permit authorization under the Act, with the exception of bridges and causeways that must be approved by the U.S. Coast Guard under CFR Title 33, Vol.1, Parts 1 – 124. Examples of work requiring approval include mooring cells and dolphins, commercial barge docks, breakwaters, recreational docks and piers, launching ramps, aerial power line crossings, submarine pipeline crossings, dredging, fills, rip rap, retaining walls, intakes, and outfalls.

Section 404 of the Clean Water Act (CWA) regulates any discharge of dredged or fill material into all waters of the US, including wetlands. The act authorizes the USACE to issue permits for discharges of fill material in waters after appropriate public review, which may include issuance of public notices. The Environmental Protection Agency (EPA) has oversight of the Section 404 Program and can restrict discharges into certain areas after compliance with established procedures. Water Quality Certification is required from TDEC. The USACE is actively involved in evaluating watershed problems, particularly in the Nashville area. Section 10 Permits are required for navigable streams not covered by a Coast Guard Bridge Permit.

**Tennessee Valley Authority (TVA)**

TVA is a federal agency that operates and manages the dams and reservoirs on the Tennessee River system for multipurpose development. The following programs cover activities associated with hydrologic modification and construction activities:

Section 26a Review and Approvals Section 26a of the TVA Act requires that TVA's approval be obtained prior to the construction, operation, or maintenance of any dam, appurtenant works, or other obstruction affecting navigation, flood control, or public lands and reservations across, along, or in the Tennessee River or any of its tributaries. Such obstructions include, but are not limited to, boat docks, piers, boat houses, rafts, buoys, floats, boat-launching ramps, bridges, aerial utility crossings, and fills.

If the construction, maintenance, or operation of a proposed facility or structure, or any part thereof for which approval is sought may result in any discharge into navigable waters of the US, the applicant must also submit a certification in accordance with Section 401 CWA. This certification documents, with reasonable assurance, that the proposed activity will not violate applicable water quality standards. The applicant must provide an erosion and sediment control plan for projects, activities, or actions that, in TVA's judgment, have the potential for a substantial adverse impact.

A number of federal (USACE, EPA, USGS) and state programs regulate some of the activities that are covered under Section 26a. However, no program, other than statutory authority, expressly mandates the consideration of the three areas specified in Section 26a of the TVA Act--navigation, flood control, and public lands or reservations in terms of the unified development and regulation of the Tennessee River and its tributaries. The TVA cooperates closely with other agencies having similar regulatory responsibilities. Such cooperation between USACE and TVA has substantially improved understandings between the agencies, increased the opportunity for public input to the review and approval process, and reduced the paperwork burden placed on Section 26a applicants.

Tennessee Department of Transportation (TDOT)

TDOT operates under federal and state laws and regulations for the construction of highways, bridges and culverts. The following is a list of guidelines and other documents TDOT uses to control erosion from their projects.

- Standard specifications for Road and Bridge construction
- A Policy on Geometric Design of Highways and Streets
- Best Management Practices for Erosion and Sediment Control
- Reducing Nonpoint Source Water Pollution by Preventing Soil Erosion and Controlling Sediment on Construction Sites, A Training Manual for Construction Inspection Personnel.

The design uses these guidelines and field information to plot the drainage patterns associated with the project and must develop an erosion control plan that is incorporated into the construction plans. Appropriate notes are included on the plan sheets as guidance for the contractor in implementing the plan. It is the responsibility of the assigned project engineer to ensure that the erosion control plan is implemented. Any improvements or adjustments to the erosion control plan are made at the discretion of the project engineer.

1.2 CONSTRUCTION

All grade and drain projects crossing or impacting jurisdictional wetlands require a Section 404 (CWA) Permit. Any construction project that impacts waters of the state requires an Aquatic Resource Alteration Permit (ARAP) under the Tennessee Water Quality Control Act (TWQCA). Any construction project that disturbs more than five acres of land requires an NPDES permit. These permits require the implementation of BMPs to control erosion and minimize pollution.

The TDOT has a Technology Transfer and Research Program through which the department tests new materials, develops training courses and manuals, and conducts research that will benefit TDOT in constructing a safe, efficient, and environmentally sensitive transportation system.

A new Environmental Coordinator position has been established in each of TDOT's regional offices across the state. The Environmental Coordinator is responsible for reviewing erosion control plans and making on-site inspections to ensure that erosion controls are implemented and properly installed.

The effectiveness of erosion controls is improved by compliance checks and routine follow-up on recommended practices throughout the construction process. Cooperation between TDOT contractors and subcontractors is mandatory in implementing a successful erosion control plan. The continuing training of TDOT personnel, contractors and subcontractors is reinforcing the need for erosion control BMPs.

Tennessee Department of Environment and Conservation, Water Pollution Control (TDEC-WPC)

State water pollution control regulatory programs are authorized by the Tennessee Water Quality Control Act, (T.C.A. 69-3-101, et seq.). TDEC-WPC has the responsibility of requiring permits for projects that alter the physical, chemical, biological, bacteriological, or radiological properties of waters of the state. This includes such activities as gravel dredging, some water withdrawals, and channel alteration activities. A summary of specific programs within WPC that address activities related to nps pollution follows.

State Water Quality Permit

Since the Water Quality Control Act was passed, TDEC-WPC issues water quality permits for a variety of activities that may impact the waters of the state, but do not have a point source discharge and are not covered by the NPDES program. Examples of these activities include sand and gravel dredging not requiring an individual Federal 404 (CWA) or Section 10 (RHA) permit, bridge construction, and stream channel alterations.

In 1985, the establishment of the ARAP program improved consistency and uniformity of water quality permitting. Seventeen General Permits are currently established. These permits are as follows: launching ramp construction; bridge scour repairs; emergency road repair; road crossings; sand and gravel dredging; stream restoration and habitat enhancement; utility line crossings; minor wetland alterations; wet weather conveyances; stream bank stabilization; surveying and geotechnical exploration; minor dredging; alteration and restoration of intermittent

1.2 CONSTRUCTION

streams for mining; maintenance activities; relocation of intermittent streams; wetlands restoration and enhancement; impoundment of intermittent streams.

General permits specify circumstances under which each applies, and establish conditions equivalent to BMPs that must be followed for an activity to be authorized by the general permit. Other alterations may be authorized by individual ARAPs. State water quality permitting for hydrologic modification permits are closely coordinated with USACE and TVA. The intent of all permits is to maintain the ability of the state's waters to support classified uses. An ARAP Handbook is available at:

<http://www.state.tn.us/environment/permits/handbook/arap.htm>.

OHV: Off-Highway Vehicles Committee

The NPS program, along with many other state, federal, and private organizations, is part of a committee initiated by the Tennessee Environmental Policy Office to review state policies governing the use of off-highway vehicles. These vehicles, which include 4x4s, ATV's, dirt bikes, and motorcycles, are increasing in popularity and use. A variety of issues are being discussed including noise and environmental impact, and trail sharing with other outdoor enthusiasts. Issues of liability for private, state, and federal landowners must be also addressed, as well as regulations against trespassing. The strategic planning process will likely last one year. The Committee will recommend how Tennessee should manage this form of recreation. The Committee is being supported by grants from TEA-21, EPA, and TDANPS.

OTHER FUNDING SOURCES

Additional funding sources for environmental projects are listed in the Catalog of Federal Funding, which can be found at: www.aspe.os.dhhs.gov/cfda

CURRENT 319 PROJECTS

The following is a list of current and proposed 319 projects for construction.

Grant Yr.	Project Title
FY-96	UT Urban Manual/workshop (phase I)
FY-97	Construction video
FY-98	UT Urban Manual/workshop (phase II)
FY-99	Five Rivers: Urban NPS Demo & Education
FY-99	Smokey Mountains: TN Valley Urban NPS
FY-99	Pigeon Roost Creek Urban Runoff
FY-2000	OHV: Off-Road Vehicles Committee

AREAS FOR PROGRAM EXPANSION

- Enlarge the Construction Working Group to include all interested groups.

1.2 CONSTRUCTION



- Develop education initiative focusing on the importance of stable streams and their association with surface water quality.
- Develop statewide public awareness campaigns reaching property owners, construction companies, developers, city, and county officials.
- All county governments need to initiate programs addressing environmentally sensitive land use and development.
- Develop more projects to demonstrate technologies for construction in ecologically sensitive areas.
- Broaden the contractor certification program.

ENFORCEMENT MECHANISMS

A main goal of the TN Water Control Act is to prevent water pollution through permitting and enforcement provisions. Violations of permits or engaging in any non-exempt activity, which results in water pollution can result in civil penalties or even criminal prosecution.

TENNESSEE ANTIDegradation POLICY

Tennessee's Antidegradation Statement is found in the Tennessee Department of Environment and Conservation Rule 1200-4-3-.06. . The primary purpose of the antidegradation policy is to establish a greater level of protection for those waters that are identified to be of high quality. Some high quality waters are those at near pristine conditions. Others are determined to be high quality due to specialized uses and/or unique features. Generally, there are two types of high quality waters. Outstanding National Resource Waters (ORNWs), or Tier 3 waters, are specifically designated by the Water Quality Control Board and are afforded the greatest level of protection. No new discharges, or expansion of existing discharges, are allowed to result in degradation of the existing water quality. Other high quality waters are identified by the Department as Tier 2 waters, which are also protected against degradation. Some degradation may be allowed only if the Water Quality Control Board deems it economically and socially necessary. Other surface waters not specifically identified and/or designated as high quality are referred to as Tier 1 waters. Tennessee's Water Quality Standards must be achieved and/or maintained in these waters.

Certification of Federal Permits

In addition to state permits, WPC processes Section 401 water quality certifications, as required by the CWA. Certifications are for federal permits issued by USACE, the USCG, FERC, and TVA. Most federal permit reviews are of USACE Section 404 permits for discharge of dredged or fill materials associated with stream relocations and channelization, work in wetlands, bridge construction and commercial and recreational dock facilities. Through the conditions of these permits, WPC regulates NPS pollution from activities involving the deposition of fill material in waters of the state, including wetlands.

National Pollutant Discharge Elimination System (NPDES) Permits

NPDES Permits are required for developments of five acres or more.

<http://www.state.tn.us/environment/permits/npdes.htm>. TDEC carries out the NPDES mandate. About 800 sites are permitted each year, for road building projects,

1.2 CONSTRUCTION



commercial and industrial development, golf courses, residential development and installation of utility lines. Compliance and enforcement actions are followed and occasionally result in civil penalties against violators.

Class V Injection Well Permit

A Class V Injection Well permit is required for any project that affects flowing water into an open sinkhole or cave. This permit addresses any impact that may affect the groundwater via a sinkhole.

Tennessee Wildlife Resources Agency Reelfoot Watershed Management Permit

This permit is required for all projects that affects water flowing into the drainage basin of Reelfoot Lake. This permit requires a joint application to TDEC.

United States Coast Guard Coast Guard Bridge Permit

This permit is required for projects that impact streams deemed navigable by the Coast Guard. Water Quality Certification is required by TDEC-WPC.

MEASURES OF SUCCESS

- All Tennesseans realize the importance of stable and functioning streams and their association with land use and water quality.
- All development takes into consideration the hydrology of the area and builds to retain pre-development hydrology.
- All county governments have initiated locally operated programs, which seek development in an environmentally sensitive manner.
- All streams on the 303(d) list because of hydrologic modification have been removed and no new waters are added.

MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, in person or through electronic means, to strengthen existing partnerships and to foster greater trust, commitment and accountability.

- **Action 1:** The Construction-Hydrologic Modification Working Group (CHWG) will meet semi-annually.
Lead: TDA-NPS Program
Key Partners: ABC, COC, EPA, FHWA, TAPA, TACD, TCA, TCSA, TDA-ARC, TDEC, TDEC-WPC, TDOT, THBA, THDA, TML, TNRC&D, TUDA, TVA, TWRA, USACE, USCG, UTAE, UTCEED, UTRRC, UTCIS, USDA-NRCS-CFSA, CTAS, MTAS, Consultants.
Year(s): 2001-2005
- **Action 2:** Increase CHWG membership by one member each year.
Lead: TDA-NPS Program
Key partners: CHWG
Year(s): 2001-2005
- **Action 3:** Establish a CHWG mission statement, a list of collective capabilities, and priorities for funding.
Lead: CHWG
Year(s): 2001-2005
- **Action 4:** Work with other agencies to develop construction projects.
Lead: CHWG and TDA-NPS Program
Key partners: CHWG
Year(s): 2001-2005
- **Action 5:** Develop Memoranda of Agreement with key federal agencies to improve programmatic consistency.
Lead: TDA-NPS Program
Key Partners: All federal agency partners
Year(s): 2001-2005

Long Term Goal 2.

Fully implement all developed TMDLs for nonpoint sources in compliance with existing regulations, policies, or agreements by 2015.

Refer to Chapter 1.11, TMDL Implementation for specific action items related to this Long Term Goal.



Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- **Action 1:** 20% of the streams impaired due to construction on the 1998 303(d) List will support their designated uses.
Lead Agencies: TDA-NPS Program
Key partners: CMWG
Year(s): 2005
- **Action 2:** 40% of the streams impaired due to construction on the 1998 303(d) List will support their designated uses.
Lead: TDA-NPS Program
Key partners: CMWG
Year(s): 2010
- **Action 3:** 60% of the streams impaired due to construction on the 1998 303(d) List will support their designated uses.
Lead Agencies: TDA-NPS Program
Key partners: CMWG
Year(s): 2015
- **Action 4:** Develop at least two 319 funded projects that addresses construction for 303(d) streams.
Lead: TDA-NPS Program
Key partners: CHWG
Year(s): 2001-2005
- **Action 5:** Target Grant Pool Money towards streams on the 303(d) that have pollutant source as construction.
Lead: TDA-NPS Program
Key partners: TDA-NPS Program, local SCDs, TNRC&D
Year(s): 2001-2005

Long Term Goal 4.

Beginning in 2006, through regulatory and non-regulatory means, prevent previously unlisted waters from being included on the 303(d) List because of nonpoint source impairments.

- **Action 1:** Encourage cities and counties to develop construction ordinances and codes.
Lead: TDEC, TDA-NPS Program
Key partners: CHWG
Year(s): 2001-2005
- **Action 2:** Continue to improve implementation of BMPs for construction of roadways and bridges - electric transmission construction and maintenance.
Lead: TDOT
Key partners: CMWG
Year(s) : 2001-2005
- **Action 3:** Continue to achieve the goals outlined in TDOT's Strategic Management Initiatives.
Lead: TDOT
Key partners: CHWG
Year(s): 2001-2005
- **Action 4:** Continue to Investigate complaints, implement strict enforcement of existing regulations on the proper installation and maintenance of erosion control BMPs in the construction of roads, bridges, and culverts.
Lead: TDEC-WPC
Key partners: CHWG
Year(s): 2001-2005
- **Action 5:** Continue to review Standard Specifications and Construction Practices. Revise and clarify, as needed, particularly Section 209 "Project Erosion and Siltation Control".
Lead: TDEC-WPC, TDOT
Key partners: CHWG
Year(s): 2001-2005

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution, and how to prevent it.

- **Action 1:** Fund at least one new demonstration project annually demonstrating methods to mitigate construction polluted runoff.

Lead: TDA-NPS Program

Key Partners: CMWG

Year(s): 2000-2015 and beyond
- **Action 2:** Support the Tennessee Erosion Control Training Program.

Lead: TDEC-WPC

Key partners: CMWG

Year(s): 2001-2015
- **Action 3:** Continue TDOT's annual training program for construction and maintenance personnel.

Lead: TDOT

Key partners: CMWG

Year(s): 2001-2015
- **Action 4:** Continue to conduct training and information sessions on erosion control BMPs at TDOT regional workshops.

Lead: TDOT

Key partners: CMWG

Year(s): 2000-2005
- **Action 5:** Develop focused public awareness campaign reaching property owners, construction companies, developers, city, and county officials, developing /adapting and/or reprinting necessary education materials.

Lead: TDA-NPS program

Key partners: CMWG

Year(s): 2000-2005
- **Action 6:** Increase public awareness and understanding of nps issues by developing two new construction demonstration 319 projects.

Leads: TDA-NPS Program

Key partners: CMWG

Year(s): 2001-2005



Long Term Goal 6.

Through the process of continuous improvement, routinely assess all programmatic functions of the TDA-NPS Program in order to maximize efficiency, decrease the bureaucratic burden and increase the numbers of participants in the program.

- **Action 1:** Investigate other funding sources as well as EPA.
Lead: TDA-NPS Program
Key partners: CMWG
Year(s): 2001-2005

Long Term Goal 7.

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

See Chapter 1.9 for action items related to water quality monitoring for the TDA-NPS Program.

INTRODUCTION



This chapter conveys the local, state, and federal agency as well as the private sector commitment to protect and improve the water quality of surface and ground water impaired by nonpoint source urban runoff activities.

DESCRIPTION

The state of Tennessee has experienced a tremendous amount of urban growth. This growth produces:

- More impervious areas: hydraulic loading, rooftops, driveways, parking lots, roads.
- Loss of riparian zones.
- Increased human and animal contact with streams.

These contribute an increased amount of pollutants to local streams and ground water aquifers. Waters are degraded through loss of habitat, increased sediment and pollutant loadings. Loss of riparian zones can cause downstream flooding conditions and contaminate subsurface water supplies.

In the mid-1990s, the four largest local governments (Memphis, Metro Nashville, Knoxville, and Chattanooga) were required to oversee new construction to ensure the implementation of proper storm water Best Management Practices (BMPs), while on a statewide basis, areas greater than five acres were also required to implement storm water BMPs. This was all required by the National Pollution Discharge Elimination System (NPDES) Phase I permit. Phase II of the stormwater program will be effective in 2003 and will include the following local governments:

The state agency that administers the federal NPDES permitting program is TDEC-Division of Water Pollution Control (WPC) through the State of Tennessee Rule 1200-4.

Several storm water issues are not subject to current state regulation. These non-addressed issues include the retrofitting of storm water BMPs into existing impervious areas, the stabilization of eroding streambanks, rivers, and lakes, and the restoration of degraded riparian zones. These issues can be solved by better local planning, 319 demonstration and education projects, the adoption of local ordinances, and effective enforcement.

The TDA-NPS Program will establish demonstration projects in cities and urbanized areas where water quality problems can be solved, and so that city and county officials can learn from these demonstration projects and implement



similar projects within their areas of responsibility. TDA-NPS Program will seek to leverage SRF funding, non-profit association funding, and local government funding.

With the assistance of the Urban Runoff Working Group, the TDA-NPS Program will learn what type of projects can be addressed with 319 Program funds while determining where these funds would produce the greatest amount of benefit. The working group will provide direction to the TDA-NPS Program as to specific types of projects that need funding. Based upon experience and knowledge obtained from storm water programs in and outside of the state, the TDA-NPS Program will address the following:

Education/Stewardship	Ordinances/Enforcement
Retention/Detention	Planning/Engineering/Construction/Maintenance
Filtration/Traps	Stabilization/Riparian restoration
Irrigated reuse	Perviousness

EXTENT OF PROBLEM

Water Quality problems from urban runoff include:

- Rapidly changing stream flows
- Increased quantities of water flowing in streams
- Greater human and animal contact with waters
- Large increases in impervious area
- Localized flooding
- Increased pollutant loadings

303(d) LISTED WATERSHEDS

Approximately, 22 percent of the 352 streams found on the 1998, 303(d) List or 79 streams are impaired by storm water/urban runoff issues. Please refer to the 1998 303(d) List, Appendix H.

SOLUTIONS

Many structural, non-structural and multiple BMP systems exist to minimize or eliminate pollution from urban runoff.

Below is a partial listing:

- Check dams
- Silt fences
- Buffer strips
- Retention ponds
- Seeding/Sodding
- Detention ponds
- Swales
- Stabilized banks



- Sediment/debris basins
- Riparian zone restoration
- Urban forestry
- Strategic clearing & grading
- Temporary ground cover
- Street cleaning
- Retention basin/swale/infiltration trench/injection well system
- Modified existing ponds with littoral zones/native aquatic plants

A source for specific information about these and other BMPs can be located on the internet at: <http://www.bmpdatabase.org> or http://www.nashville.org/pw/bmp_manual.html

Programmatic efforts, as listed below, are also essential to the elimination of pollution from urban runoff.

- Local ordinances/enforcement
- Support of local officials
- Public education projects/materials
- On-going maintenance program
- Local citizen stewardship programs
- Public feedback forums
- Watershed management programs

COOPERATING PARTNERS

Partners

American Society of Landscape Architects
Development Districts
Local landowners
Local governments
Lawn service companies
Lawn & garden clubs
Soil Conservation Districts
Tennessee Department of Economic & Community Development
Tennessee Department of Environment & Conservation
 Division of Community Assistance
 Division of Water Pollution Control
 Division of Water Supply
Tennessee Department of Transportation
Tennessee Home Builders Association
Tennessee Municipal League
Tennessee Parks & Greenways Foundation
Tennessee Resource Conservation & Development Districts
Tennessee Society of Professional Engineers
Tennessee Technological University
Tennessee Valley Authority
Tennessee Wildlife Resource Agency

Abbreviations

ASLA

SCDs
TDE&CD
TDEC
 -DCA
 -WPC
 -DWS
TDOT
THBA
TML
TP&GF
TNRC&D
TSPE
TTU
TVA
TWRA



US Department of Agriculture-Natural Resources Conservation
Service
US Fish & Wildlife Service
UT Center for Industrial Services
UT County Technical Assistance Service
UT Municipal Technical Advisory Service
UT-Water Resources Research Center

USDA-NRCS
USF&WS
UT-CIS
UT-CTAS
UT-MTAS
UT-WRRC

The following text further defines the programs of the above referenced partners.

American Society of Landscape Architects (ASLA)

Certified landscape architects are accustomed to participating as partners in remediation and abatement projects. These professionals can provide valuable information to municipalities as well as provide the services of landscape design and construction oversight to ensure that the BMP is not only aesthetically pleasing, but is also functional and long-lasting. The ASLA can provide technical assistance and guidance.

Development Districts

The purpose of a development district is to ensure the consistent and wise growth of its district's geographic area. The development districts will be a leader in ensuring that all local governments understand the importance of clean water and are willing to show good stewardship to ensure that it is achieved.

Landowners

Local landowners are the key to the success of any water quality effort. By remaining advocates of local water quality, demanding that local officials pursue clean water efforts, practicing good stewardship, and spreading the word to others throughout their community, they provide the base upon which all water quality efforts can be built. Landowners can also play a key role in allowing demonstration projects placed upon their properties and then maintaining and demonstrating these to others.

Lawn service companies

Lawn services companies can serve as demonstrations for proper mixing, storage, and application of pesticides in residential and commercial areas throughout the states. This has already been done by the TDA-Regulatory Services Division and has proven to be a possible means of expanding the knowledge of other citizens in the service area of the company. These companies could also serve as a distribution system of educational materials addressing proper mixing, storage, and application. This would be done through their contacts with their clients, hosting periodic clean water meetings, establishing educational signage at highly visible public locations throughout the community, and setting up pesticide displays at public functions such as fairs and school activities.

Lawn & garden clubs

These citizen-driven groups can serve as educational (proper pesticide application, storage, and disposal) distribution points. A network of these groups exists within a statewide association that can serve as linkage for efforts between



municipalities and counties. These clubs could also serve as outreach partners placing pesticide educational materials at many public forums, such as, environmental fairs and school functions.

Local governments

(city and county elected officials and planning, health, public works, recreation, and education departmental staff)

As many of Tennessee's towns, suburbanized areas, and cities experience residential and commercial growth a significant amount of farm land and woodlands are being converted to more impervious surfaces. During the construction phase of this transition, as well as later when the impervious surfaces are in place, the local city and county governing bodies along with the citizens will need to remain aware of and protect the existing ag-related remediation efforts. More importantly, the governing bodies will need to assume the leadership role of the nps effort by educating the citizens of the need for water quality measures and establishing means in which to ensure that these measures are faithfully used by all developers, contractors, and landowners.

The TDA-NPS Program can assist in the development of local sites that demonstrate the most effective BMPs. This can be done in non-NPDES areas where permits are not in place. The TDA-NPS Program can also assist NPDES and non-NPDES cities in any restoration project not specifically required by an NPDES permit.

Private consulting firms

Private consulting firms have water quality specialists and engineers who are accustomed to participating in remediation and abatement projects. These professionals can provide valuable information to municipalities as well as provide the services of planning, design, and construction oversight. Consulting firms can perform reconnaissance studies to determine what type of remediation is needed and then provide the needed BMPs as well. Consulting firms will participate in functions of the urban runoff working group, thereby ensuring that projects funded by the TDA-NPS Program are technically sound and will function properly.

Soil Conservation Districts (SCDs)

The soil conservation district board of each county will be a partner in the effort to reduce nps pollution to the local streams and subsurface drainage. The SCD, as a primary state contractor, can provide a significant amount of financial assistance to local water quality efforts regardless if they are agricultural or not. Through its direct interaction with the local NRCS district conservationist, the SCD will also direct technical as well as administrative assistance to local water quality remediation efforts.

Tennessee Department Agriculture (TDA) – Forestry Division

TDA foresters are among the best individuals to consult for information regarding the reforestation of many denuded high slope and streamside areas in the suburbs and urban areas of Tennessee. These water quality professionals can also serve as educators of proper forestry management/water quality techniques.



As greenways are developed in the urbanized areas of Tennessee the TDA-NPS Program will assist in establishing local water quality teams. These teams will be comprised of recreation department staff, water quality professionals, foresters, TP&GF staff, educators, and citizens with the intent of reforesting these greenways to serve as buffers and developing signage along the eventual walking trails to serve as an educational tools. Tennessee has three urban foresters.

Tennessee Department of Economic & Community Development (TDE&CD)

One of the most important roles of TDE&CD is to ensure the consistent and wise growth of the state and its regions. It is imperative that the state and its individual regions have a healthy source of drinking water. The TDE&CD will be a leader in ensuring that all local governments understand the importance of clean water and are willing to show good stewardship to achieve this goal.

TDEC-Division of Community Assistance (TDEC-DCA)

As the TDA-NPS Program demonstrates new building and retrofitting urban runoff BMPs across the state it will also be endorsing the use of the State Revolving Funds (SRF) Program, a financial assistance program managed by TDEC-DCA. The TDA-NPS Program has held meetings with TDEC-DCA concerning the use of these funds in an effort to assist in the construction of storm water BMPs throughout the state. Once a city or county witnesses a 319 funded BMP demonstration it will realize the advantages of implementing such a BMP and contact the SRF Program for a low interest loan.

TDEC-Division of Water Pollution Control (TDEC-WPC)

TDEC-WPC will monitor the receiving streams before and after the implementation of BMPs in the suburbs and cities of the state. Currently, TDA-NPS Program is assisting TDEC-WPC in this effort by providing them with funding to for a portion of their monitoring efforts. This type of water quality data can assist the TDA-NPS Program in focusing in on urban runoff problem areas, while producing the data needed to confirm that urban runoff BMPs have solved the water quality problems.

Phase I cities as well as future Phase II cities will be required, through permits, to perform certain water quality activities that cannot be paid for with 319 funds. By meeting with city officials, the TDA-NPS Program will learn what these requirements are as well as how the TDA-NPS Program can partner with the city on non-permitted issues such as storm water retrofitting and stream bank stabilization projects.

TDEC-Division of Water Supply (TDEC-DWS)

TDEC-DWS is interested in the advancement of any efforts that will improve water quality upstream of public water supply intakes across the state. Any activity that would improve ground water quality would also be of interest to TDEC-DWS.

TDEC-DWS also manages the Source Water Assessment Program (SWAP), which is presently performing pollution source assessment studies along a corridor of 2000 feet wide by five-miles long above each surface water intake.



These studies will produce inventories of nonpoint source problem areas. The TDA-NPS Program will use information collected through SWAP as a target future projects.

Tennessee Department of Transportation (TDOT)

Federal and state highways criss-cross the rapidly growing suburban and urban areas of the state providing more accessible and effective access from one point to another. Yet, in the same vein, the road systems introduce a tremendous amount of hydrocarbon and heavy metal concentrations to the local receiving streams and subsurface aquifers.

The TDA-NPS Program has the ability to introduce specially designed retrofitted BMPs to catch these pollutants before they enter the neighboring water resources. TDOT also has the ability to partner with 319 funds to create these types of BMPs at heavily used interchanges in suburban and urban settings across the state. By partnering, these state agencies could establish demonstrations of such BMPs geographically disseminated across the state and then invite city, county, and other related officials to view these BMPs. Once this is accomplished the TDEC-DCA could fund any subsequent proposed BMPs with SRF Program funds at a low interest rate.

Tennessee Home Builders Association (THBA)

The THBA has the ability to convey the importance of proper BMPs to the growing construction industry of the state. Not only can it assist in the training of construction personnel, but it can also assist in conveying the importance of storm water BMPs to developers and planners so that these professionals will be more likely to incorporate them into their construction plans.

Tennessee Municipal League (TML)

The TML is an organization to which cities throughout the state belong. It will serve as a networking partner with the TDA-NPS Program. Its role would be to inform local officials across the state of water quality issues and the necessity to initiate water quality BMPs through 319 and SRF funding as well as other funding sources.

Tennessee Parks & Greenways Foundation (TP&GF)

The TP&GF is involved in acquiring lands along streams throughout the state. By acquiring land along the receiving streams, it can apply riparian restorations to areas that need runoff buffers, thereby providing water quality improvements and habitat benefits to the stream.

By teaming up with the local recreation department, TDA-NPS Program, TDA-Forestry Division, RC&D Council, and the local citizens, TP&GF could provide restoration assistance to Tennessee's communities. Additionally, it could provide educational signage addressing water quality and habitat restoration issues along these greenways.

Tennessee RC&D Council (TNRC&D)

The eight RC&D districts across the state will be instrumental in the development of urban runoff BMP implementation projects in many of Tennessee's fastest



growing areas. Two RC&D Districts are currently under state contract to partner with local governments to initiate demonstration BMPs throughout their multi-county areas. The intent of these contracts is to familiarize local governments with the advantages of establishing construction and storm water runoff BMPs. It is hoped that once these governments implement their BMPs they will see the merit in using BMPs throughout their city or county. A partnering effort between the governments will also be initiated in an effort to exchange BMP construction and maintenance knowledge with one another. In this manner, a wide array of BMPs can be implemented in the future.

Tennessee Society of Professional Engineers (TSPE)

The TSPE member association can be used to direct information to the consulting engineers of Tennessee concerning project ideas and funding sources for their clients.

Tennessee Valley Authority (TVA)-Resource Stewardship Watershed Team Program

The TVA water quality professionals have the ability to generate local involvement while providing water quality expertise. Water quality monitoring as well as aerial photography land use inventory capabilities from TVA provide substantial technical support to this urban runoff effort. TVA has the financial capability of funding ancillary projects that could assist in promoting many of the needed BMPs.

Tennessee Wildlife Resource Agency (TWRA)

The TWRA biologists and water quality professionals are well informed about what aquatic life should be present in the receiving streams as well as what needs to be done to protect flora and fauna. Biological monitoring and participation in working group meetings will be provided by the local TWRA staff. TWRA could provide educational information and material to restore the local fisheries as the local water quality improves.

Tennessee Technological University (TTU)

The TTU-Water Center is currently under state contract to partner with local governments to initiate demonstration BMPs throughout the Pigeon Roost Creek watershed of south Cookeville. The intent of this contract is to familiarize local governments with the advantages of establishing storm water runoff BMPs. It is hoped that once the City of Cookeville implements this BMP it will see the merit in using BMPs throughout the city.

USDA-Natural Resources Conservation Service (NRCS)

The local district conservationist (DC) representing the NRCS will serve as an advisor and possibly, the designer for many sediment control problems found in suburban and urban areas. Many of the contacts with the landowner at the BMP site will be the DC. The NRCS state engineer will also play a role in the design of the more complex and larger sediment control BMPs.

US Fish & Wildlife Service (USF&WS)

USF&WS has been funding and assessing water quality in Tennessee streams for many years. Data collected is used by TDEC-WPC in all permitting decisions.



This agency provides considerable expertise in the field of biological integrity as well as funding assistance in certain cases.

US Golf Course Association-Tennessee Chapter

With the constant growth of urban areas throughout the state comes the increase in the number of golf courses. Public and private Tennessee golf course managers attend meetings to gain training about proper use and control of pesticides and their impact on water quality. These golf courses could be an important public education site where displays and water quality information is transferred to the public.

UT County Technical Assistance Service (UT-CTAS)

As the county government initiates water quality BMPs for urban runoff problems UT-CTAS will serve an important role towards assisting the local department with technical expertise while planning and implementation stages are in progress. This effort will be easily paired with any 319 BMP implementation in the watershed as well.

UT Municipal Technical Advisory Service (UT-MTAS)

As the city government initiates water quality BMPs for urban runoff problems UT-MTAS will serve an important role towards assisting the local department with technical expertise while planning and implementation stages are in progress. This effort will be easily paired with any 319 BMP implementation in the watershed as well.

UT Center for Industrial Services (UT-CIS)

UT-CIS will play a key role in training planners and construction personnel statewide in using water quality BMPs. UT-CIS is currently in the process of producing a 319-funded videotape that addresses the proper use of construction BMPs.

UT-Water Resources Research Center (UT-WRRC)

In partnership with the UT Department of Civil and Environmental Engineering, UT-WRRC is under state contract to produce a manual which illustrates all available storm water management BMPs as well as how to properly permit and maintain them. This effort is partially supported with 319 Program funds in an effort to introduce the use of proper urban runoff/storm water and construction BMPs to the city and county governments across the state. The manual will be reviewed by members of the 319 Program's Urban Runoff working group and also presented at three workshops attended by city and county officials.

Ancillary Programs

The activities of the TDA-NPS Program will need to be coordinated with the existing NPDES efforts to ensure that 319 funds are not expended on satisfying permit requirements, while building a strong partnership with the city to facilitate the exchange of clean water ideas. The TDA-NPS Program will also coordinate with the TDA-Regulatory Services Division's Pesticide Management Program to ensure no overlap occurs there either, rather a partnering effort to enhance one another's effectiveness.



OTHER FUNDING SOURCES

TDEC-DCA administers the State Revolving Loan Program that can be used to fund urban runoff projects. The TDA-NPS Program will coordinate with TDEC-DCA to increase the number of nonpoint source project proposals they receive for funding.

Additional funding sources for environmental projects are listed in the Catalog of Federal Funding, which can be found at: <http://www.aspe.os.dhhs.gov/cfda>

TDA-NPS will inform all partners and funding recipients about this comprehensive list.

CURRENT 319 PROJECTS

The TDA-NPS Program introduced storm water/urban runoff projects in 1997. This effort was originated through a partnership of the University of Tennessee, the City of Chattanooga, and the TDA-NPS Program. From this partnership, one working group and two projects were developed.

The URWG was formed in 1997. This has served as a forum for the exchange of ideas and the peer review of the phase I and phase II storm water manuals. The URWG will provide the TDA-NPS Program with feedback on project proposals, so that projects of the highest quality will be funded.

A storm water manual intended for elected officials was first thought of as a means of introducing city mayors and county executives to this issue. An introductory manual to storm water and urban runoff, developed in 1999 by the University of Tennessee Water Resources Research Center, was accompanied by a filmed, one-day workshop, which took place on June 24, 1999. More than fifty city and county officials attended this workshop. Printing and distribution of the manual and editing, reproduction, and distribution of the videotape will be funded through future grants.

A second storm water manual intended for technical officials has a 2000 release date. It will be accompanied by a filmed, one-day workshop held in three locations. This manual will be a compilation of BMPs accompanied by instructional assistance addressing how to plan, permit, implement, and maintain urban runoff BMPs. A videotape, intended for wide distribution, will also be a product of this project.

The following is a list of current and proposed 319 projects addressing urban runoff.

<u>Grant Year</u>	<u>Project Title</u>	<u>Location</u>	<u>Status</u>
FY-96	Storm water Mgmt. – Elected Officials (man. & workshop) Phase I	Statewide	Complete
FY-98	Storm water Mgmt. – Technical	Statewide	In-process



	Officials (man. & workshop) Phase II		
FY-99	5 Rivers RC&D Urban NPS Demonstration	NW Middle TN	In-process
FY-99	Tennessee Valley Urban NPS	East TN	In-process
FY-99	Urban NPS BMPs for Sinkhole Drainage in Pigeon Roost Creek (Cookeville)	Putnam/ Middle TN	In-process

AREAS FOR PROGRAM EXPANSION

TDA-NPS Program is working with TDEC-WPC to restore impaired waters and to fully implement TMDLs. As TMDLs are developed for pollutants from urban runoff, more projects of this type will be funded.

The challenges associated with Urban Runoff are complex. Emphasis will be placed on funding projects that seek to educate elected officials and professionals about the potential consequences of development on water quality. TDA-NPS will investigate the Nonpoint Education of Municipal Officials (NEMO) Program.

WATER QUALITY MONITORING & ASSESSMENT

TDA-NPS Program supports the watershed based monitoring program of TDEC-WPC. Additional funding for monitoring in the 11 priority watersheds identified through the Unified Watershed Assessment (UWA) is provided to TDEC-WPC. Monitoring is a required element of all NPDES stormwater permits issued by TDEC-WPC. Assessment of watersheds is performed by TDEC-DWS through the SWAP program. See chapter 1-9, Water Quality Monitoring for a comprehensive list of all groups that perform monitoring.

ENFORCEMENT MECHANISMS

The state agency that applies storm water enforcement is TDEC-Division of Water Pollution Control. This agency administers the NPDES Phase I Program as well as the Aquatic Resources Alteration Permit (ARAP) Program. In 2003, TDEC-WPC will also administer the NPDES Phase II permit program. TDEC-WPC has been assigned these responsibilities through State of Tennessee Rule 1200-4.

Any disturbances to streams are also protected by the U.S. Army Corps of Engineers through the 404 permit.

MEASURES OF SUCCESS

- Decrease in the number of stream miles impaired by urban runoff.
- Increase in the number of urban runoff educational materials produced.
- Implementation plans for all urban TMDLs developed by TDEC-WPC are written.



- Increase in the number of proposals received for funding that are focused on urban runoff.

MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, to strengthen existing partnerships and to foster greater trust, commitment and accountability.

- **Action 1:** The Urban Runoff Working Group (URWG) will meet semi-annually.
Lead: TDA-NPS Program
Key partners: TDEC-WPC; Local governments; UT-MTAS; UT-CTAS; UT-WRRC; TNRC&D
Year(s): 2001-2005
- **Action 2:** Increase URWG membership by one member each year.
Lead: TDA-NPS Program
Key partners: TDEC-WPC; Local governments; UT-MTAS; UT-CTAS; UT-WRRC; TNRC&D
Year(s): 2001-2005
- **Action 3:** Establish the URWG mission statement, a list of collective capabilities, and priorities for funding.
Lead Agencies: URWG and TDA-NPS Program
Year(s): 2001-2005
- **Action 4:** Develop Memoranda of Agreement with key federal agencies to improve programmatic consistency.
Lead: TDA-NPS Program
Key Partners: All federal agency partners
Year(s): 2001-2005

Long Term Goal 2.

Fully implement all developed TMDLs for nonpoint sources in compliance with existing regulations, policies, or agreements by 2015.

Refer to Chapter 1.11, TMDL Implementation for specific action items related to this Long Term Goal.



Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- **Action 1:** Install BMPs so that 20% of the streams impaired due to urban runoff on the 1998 303(d) List will support their designated uses.
Lead: TDEC-WPC
Key partners: Local governments; UT-MTAS; UT-CTAS; UT-WRRC; TNRC&D; TDA-NPS
Year(s): 2005
- **Action 2:** Install BMPs so that 60% of the streams impaired due to urban runoff on the 1998 303(d) List will support their designated uses.
Lead: TDEC-WPC
Key partners: Local governments; UT-MTAS; UT-CTAS; UT-WRRC; TNRC&D; TDA-NPS
Year(s): 2010

Long Term Goal 4.

Beginning in 2006, through regulatory and non-regulatory means, prevent previously unlisted waters from being included on the 303(d) List because of nonpoint source impairments.

- **Action 1:** Implement BMPs on streams not listed on the 1998 303(d) List
Lead: TDA-NPS Program
Key partners: Local governments; UT-MTAS; UT-CTAS; UT-WRRC; TNRC&D; TDEC-WPC
Year(s): 2001-2005

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution, and how to prevent it.

- **Action 1:** Develop and distribute educational material concerning Urban Runoff issues in increasing amounts each year.
Lead: TDA-NPS Program
Key partners: URWG
Year(s): 2001-2005
- **Action 2:** Provide funding to at least one urban runoff project annually.
Lead: TDA-NPS Program
Key partners: URWG
Year(s): 2001-2005



- **Action 3:** Provide information concerning Urban Runoff issues on the TDA-NPS web page.
Lead: TDA-NPS
Year(s): 2001
- **Action 4:** Develop Phase III and IV of Stormwater education of professionals and local officials regarding urban runoff.
Lead: TDA-NPS
Year(s): 2005
- **Action 5:** Investigate the feasibility of beginning the NEMO program in Tennessee.
Lead: TDA-NPS
Years: 2001

Long Term Goal 6.

Through the process of continuous improvement, routinely assess all programmatic functions of the TDA-NPS Program in order to maximize efficiency, decrease the bureaucratic burden and increase the numbers of participants in the program.

- **Action 1:** Investigate other funding sources such as The Nature Conservancy, Brownfields Program, as well as EPA.
Lead: TDA-NPS Program
Key partners: The Nature Conservancy; US EPA
Year(s): 2001-2005
- **Action 2:** Provide responses to all project related inquiries from grantees within three business days of the request.
Lead: TDA-NPS Program
Year(s): 2001-2005
- **Action 3:** Work with grantees to achieve timely submittal of all progress reports 100% of the time.
Lead: TDA-NPS Program
Year(s): 2001-2005
- **Action 4:** Develop a Priority Ranking System for project review.
Lead: TDA-NPS Program
Key Partner: URWG
Year(s): 2001-2005
- **Action 5:** Request feedback from partners annually to assess the quality of the services provided by the TDA-NPS Program.
Lead: TDA-NPS Program
Year(s): 2001-2005



Long Term Goal 7

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

See Chapter 1.9 for action items related to water quality monitoring for the TDA-NPS Program.

INTRODUCTION



This chapter reflects the efforts of the Hydrologic Modification working group to reduce the impacts associated with hydrologic modification to Tennessee's streams, rivers, and lakes. Hydrologic modification, or hydromodification, includes stream projects such as dredging, channelization, stream alterations, flow modification and regulation, shoreline erosion, wetland disturbances, dam construction and others. In Tennessee, hydromodification

impacts streams and lakes by impairing their designated uses: 54 miles of streams are partially supporting and 38.6 are not supporting. Impacts on Tennessee's lakes: 745 acres partial supporting their designated use, TDEC-WPC 1998 303(d) Report. Management measures under this category must attempt to control the addition of pollutants to surface and ground waters by implementing the best available nps control practices, technologies, processes, criteria, operating methods and other alternatives. The working group was created to advise and set goals for the NPS Program on all hydromodification related issues related to nps.

DESCRIPTION

The nonpoint sources of pollution covered under Hydrologic Modification are grouped into three categories:

1) Stream Modification, 2) Construction, and 3) Flow Modification and Regulation.

1. Stream modification activities include
 - stream obstruction removal
 - stream channel relocation
 - channelization
 - lateral drainage and maintenance
 - sand and gravel dredging
 - maintenance dredging
 - bank stabilization.
2. Construction activities include
 - roads, bridges, and culverts
 - low-head impoundment structures and dams
 - electric transmission line construction and maintenance.
 - housing and commercial development.
1. Flow modification and regulation activities include reservoir releases and tailwaters (below the dam)



The Division of Water Pollution Control is responsible for the administration of the Tennessee Water Quality Control Act of 1977 (T.C.A. 69-3-101). Under the Water Quality Control Act, municipal, industrial and other discharges of wastewater must obtain a permit from the Division. Approximately, 1,700 permits have been issued under the federally delegated National Pollutant Discharge Elimination System (NPDES). These permits establish pollution control and monitoring requirements based on protection of designated uses through implementation of water quality standards and other applicable state and federal rules. Additional information about the permits issued by the Division of Water Pollution Control is found in the Environmental Permitting Handbook: <http://www.state.tn.us/environment/permits/handbook/>. Activities such as stream channel modifications, wetland alterations or gravel dredging are regulated by this Division. An average of 850 Aquatic Resource Alteration permits, including 125 gravel dredging authorizations are issued annually.

EXTENT OF PROBLEM

Hydrologic modification activities are responsible for several hundred miles of streams and several thousands of acres of lakes being impaired for various reasons. The following tables, taken from “The Status of Water Quality in Tennessee” 1998 305(b) Report, summarizes the impact of various sources:

Hydro/Hydrologic Modification Sources of pollutants in Rivers

Source Category	Total Impact (miles)
Channelization	6,052
Dredging	191
Flow Regulation	8
Filling and Draining Wetlands	332
Streambank Modification	250
Streambank Destabilization	24
Riparian loss	639
Habitat Modification	202
Hydromodification	378

Hydro/Habitat Modification Sources of pollutants in Lakes

Source Category	Total Impact (acres)
Channelization	4,550
Flow Regulation	15,500
Filling and Draining Wetlands	10,950
Dam Construction	0
Hydromodification	745

The use most often impacted by hydrologic modification activities, is fish and aquatic life, resulting from erosion and siltation, habitat alterations or destruction, thermal and dissolved oxygen modifications, and flow alteration. To a lesser extent, impacts to water



supply and recreation uses due to hydrologic modification activities, have also been documented.

For the purposes of this document, this chapter will focus on the following hydrologic modification activities: stream obstruction removal, stream channel relocation, channelization, lateral drainage and maintenance, sand and gravel dredging, maintenance dredging, bank stabilization; road, bridge, and culvert construction, low-head impoundment structures and dams; electric transmission line construction and maintenance; development, and reservoir releases and tailwaters - increasing dissolved oxygen (D.O.).

Wetlands:

It is estimated that Tennessee has lost 59% of its wetlands by the mid 1980's. In the past, losses of wetlands were primarily due to agricultural conversion, drainage, channelization, and sedimentation. At present, the loss/gain balance is complicated and not well defined. Current professional opinion and supporting data from the 1992 National Resources Inventory contend that the rate of wetland losses in Tennessee has significantly declined and that wetland acreage may be increasing. However, comprehensive data does not exist to accurately measure this decline. Factors affecting the balance include both primary land use conversions and long term changes in the hydrology of major drainage basins.

Although each drainage system is unique, Tennessee's wetland managers have identified several general trends, based on their observations, knowledge, and experience:

- Agricultural conversions are decreasing;
- Marginal cropland is being abandoned and allowed to revert to wetlands;
- There is less conversion of bottomland hardwoods (BLH) to cropland;
- Urban conversions are increasing; and
- Transportation impacts (highways, airport construction) are a growing factor in wetland loss, however the use of mitigation in these projects is helping to limit the net loss of wetlands acreage.
- In 1988, the former Tennessee Department of Conservation formulated a "State Wetlands Plan" as an addendum to the State Recreation Planning Report, in compliance with the Federal Emergency Wetlands Resource Act. Aerial photography and satellite imagery were used to determine that the state's vegetated wetlands comprised 639,177 acres (571,000 ac. or 89% in the western grand division and 68,177 ac. or 11% in the remainder of the state).

Massive direct and indirect human impacts have led to a significant reduction in the quality of Tennessee's wetlands. Many areas have remained in a state of early ecological succession and have not been allowed to develop naturally toward ecological maturity. Excessive or inadequate water inputs, high sediment or nutrient loads, and direct or indirect interference with vegetation have caused imbalance among the physical, chemical, and biological processes that determine wetland functions. The natural processes that might restore functional equilibrium are rarely allowed to proceed without additional interference.



Although the general picture of disequilibrium in Tennessee's wetlands is fairly clear, we do not have the detailed information necessary to fully understand and protect our wetlands resource. No state or federal agency is systematically collecting, recording, or analyzing complete information on wetlands. Except in relatively few cases where wetlands are perceived as threatened or are under consideration for purchase, little information is currently being collected on wetland functions. Such information as it is available is generally site-specific, and is collected under protocols narrowly designed to meet regulatory or agency requirements. There continues to be a major need for a consistent statewide program to evaluate the quality and functions of wetlands and monitor their condition.

Stream hydrology alteration has increased in many areas of Tennessee mainly because of landuse changes. The primary one is the conversion of farmland to housing and commercial developments; urban sprawl is a major contributing factor of this. More and better roads have allowed population to live further and further from major cities and the necessary commercial infrastructure has followed. Consequently, increasing imperviousness of the watershed has altered surface and subsurface flow. Along with the stream hydrology changes, comes streambank erosion; siltation increase; habitat destruction, introduction of other pollutants, decrease of DO and alteration of the entire stream ecology. The need for more ecologically sound development is imperative. More and better ordinances are necessary along with education of the public, county, city and developers.

Tennessee's 1998, 303(d) List has identified 352 waterbodies that do not fully support all of their designated uses. Of this number, 126, or 36% of the total number of waterbodies are impaired by hydrologic modification activities. The 1998 303(d) List has identified these activities by the use of the following terms:

Agriculture	Non-Irrigated Crop Production
Animal Feeding Areas	Pasture/Grazing
Animal Holding Areas	Pastureland
Concentrated Animal Feeding Operations	Specialty Crop Production
Crop Production	

SOLUTIONS

Hydromodification should be avoided when feasible. Where hydromodifications are unavoidable, BMPs should be implemented to avoid or minimize water quality impacts. BMPs exist for all three categories of Hydrologic Modification activities, (i.e., stream modification, construction, and flow modification and regulation). The BMPs developed for the first two activity categories (stream modifications and construction) are usually adequate to protect classified stream uses in Tennessee. Some BMPs for the third activity category (reservoir releases and tailwaters) are available, but with varying success. Site specific characteristics at each dam are still the most difficult factor to overcome in implementing cost-effective BMPs.



The need for integrated watershed management of all point and nonpoint sources, in conjunction with implementation of specific BMPs, cannot be over emphasized. In analyzing the BMPs for hydrologic modification activities, the need for managing nonpoint sources on an entire watershed basis was identified. Excessive soil erosion is a significant cause and effect of river basin-wide problems, and runoff from agricultural, urban, and mining land uses introduce pollutants that are major contributors to oxygen depletion in reservoirs.

The NPS program funds TDEC-WPC for assessment of the water quality across the state. The 303(d) designates the extent hydromodification is effecting the designated uses of the resource. As stated in the introduction: according to the 1998 303(d) Report hydromodification impacts streams and lakes by impairing their designated uses: 54 miles of streams are partially supporting and 38.6 are not supporting. Impacts on Tennessee's lakes: 745 acres partial supporting their designated use. The NPS program has instituted the Grant Pool program that is focused towards taking these streams off the list. With each iterative of the report, we will adjust projects and focused streams.

TVA's Watershed Teams actively works to implement cooperative water quality improvement projects throughout the Tennessee Valley. Watershed Teams provide technical assistance to communities involved in wetland protection efforts, and incorporate wetland protection into riparian zone protection and streambank restoration projects. These teams also implement a key goal of the Strategy by providing on-going outreach and education projects to local schools, community, and civic groups that include information about the value of wetlands for watershed health.

MANAGEMENT MEASURES

BMPs for Stream Obstruction Removal - Major Blockage

(Major blockage: causing unacceptable flow problems. Obstructions consist of compacted debris, and/or sediment that severely restrict flow).

- | | |
|----------------------------|------------------------------------|
| 1. Access Route Management | 4. Bank Clearing (minimum) |
| 2. Equipment Selection | 5. Channel Maintenance-Restoration |
| 3. Material Disposal | 6. Bendways (old river runs) |

BMPs for Stream Obstruction Removal – Non-major Blockage

(Non-major blockage: log jams and sediment deposits that occupy 25 percent or more of the channel or are located mid-channel such that increased blockage is likely to occur. This practice would involve only minor sediment removal.)

- | | |
|----------------------------|----------------------------------------|
| 1. Access Route Management | 3. Material Disposal |
| 2. Bank Clearing (minimum) | 4. Woody Vegetation Removal Guidelines |

BMPs for Stream Obstruction Removal - Minor Accumulation of drift and Debris
(Minor accumulation of drift and debris: no major flow impediment, but existing conditions would likely result in obstructions in the near future if not addressed immediately, causing unacceptable problems.)

1.4 HYDROLOGIC MODIFICATIONS



- | | |
|----------------------------------------|----------------------|
| 1. Equipment Selection | 2. Material Disposal |
| 3. Woody Vegetation Removal Guidelines | |

BMPs for Stream Channel Relocation

- | | |
|-----------------------------------|-------------------------------------------------------------|
| 1. Pool and Riffle Creation | 5. Work Completion and Stabilization before Water Diversion |
| 2. Channel Dimensions | 6. Bank Stabilization |
| 3. Erosion Control | 7. Sediment Basins |
| 4. Revegetation for Stabilization | |

BMPs for Channelization - Deteriorated Channel

(Channel deteriorated to point where normal streamflow is forced into floodplain.)

- | | |
|--------------------------------------------|-------------------------|
| 1. One Bank Channelization of Main Streams | 5. Bendways |
| 2. Access Route Management | 6. Drop Structures |
| 3. Material Disposal | 7. Watershed Management |
| 4. Bank Clearing (minimum) | |

BMPs for Channelization - Channel Enlargement

(Enlargement or enhancement of natural flood carrying capacity of stream through excavation, i.e. used to carry 100 year flood through developed areas.)

- | | |
|--------------------------------------|------------------------------------------------------------------|
| 1. Leave Stream In Natural Condition | 3. Dry Operations |
| 2. Creation of a Mitigated Channel | 4. Stabilization of Disturbed Areas when Relocation is Necessary |

BMPs for Lateral Drainage and Maintenance

- | | |
|---------------------------|----------------------------------|
| 1. Flood Plain Management | 4. Access Route Management |
| 2. Material Disposal | 5. Alignment (of lateral drains) |
| 3. Equipment Selection | |

BMPs for Sand and Gravel Dredging

(Applies to small streams not covered under Federal Regulatory Program.)

- | | |
|----------------------------|--------------------------------|
| 1. Dry Excavation | 3. Stream Crossing Limitations |
| 2. Access Route Management | 4. Material Disposal |

BMPs for Maintenance Dredging

- | | |
|------------------------------------|----------------------------------------|
| 1. Planning and Scheduling of Work | 3. Access Control |
| 2. Excavation | 4. Dredged Material Uses and Placement |

BMPs for Soil Erosion Control for Road, Bridge, and Culvert Construction

- | | |
|-------------------------------------|--------------------|
| 1. Staked Hay Bales and Silt Fences | 10. Waterspreading |
| 2. Buffer Strips | 11. Waterways |

1.4 HYDROLOGIC MODIFICATIONS



- | | |
|-------------------------------------|----------------------------------------|
| 3. Sediment Structures | 12. Temporary Stream Crossings |
| 4. Check Dams | 13. Nonerodible Cofferdams |
| 5. Brush barriers | 14. Prohibition of Construction Debris |
| 6. Clearing and Grubbing Constraint | 15. Channel Modification |
| 7. Temporary Berms | 16. Sodding |
| 8. Temporary Slope Drains | 17. Bank Stabilization |
| 9. Temporary Seeding | 18. Temporary Diversion |

BMPs for Soil Stabilization Measures for Low-Head Impoundment Structures and Dams

- | | |
|-------------------------|-------------------------------|
| 1. Check Dams | 6. Level Spreader |
| 2. Diversion Structures | 7. Drainage Outlet Protection |
| 3. Downdrain Structures | 8. Riprap |
| 4. Land Grading | 9. Sediment Traps |
| 5. Mulching and Sodding | 10. Streamflow Maintenance |

BMPs for Electric Line Construction and Maintenance

1. Temporary Stream Crossing

BMPs for Reservoir Releases and Tailwaters - Increasing D.O. (BMPs for Increasing D.O. at Hydroelectric Dams)

- | | |
|-------------------------------------------------------------------|----------------------------------------------------|
| 1. Turbine Venting | 6. Surface Water Intake (or Selective withdrawals) |
| 2. Surface Water Pumps | 7. Watershed Management |
| 3. High Purity Oxygen Injection | 8. Aerating Weirs |
| 4. Aerating Turbine | 9. Reservoir Management System |
| 5. Hypolimnetic Diffused Aeration or Oxygenation of the Reservoir | |

BMPs for Reservoir Releases and Tailwater - Minimum Streamflow at Hydroelectric Dams

- | | |
|----------------------|--------------------|
| 1. Reregulation Weir | 3. Pulsing Turbine |
| 2. Small Turbine | 4. Sluice |

EVALUATION OF BMPs

Stream Obstruction Removal

Stream obstruction removal is covered under regulatory programs of USACE and the State of Tennessee. Section 10 of the Rivers and Harbor Act (RHA) or Section 404 of the Clean Water Act (CWA) may cover this activity. State certification under subsection 401 (CWA) is required for Federal 404 permits. Aquatic Resource Alteration Permits (ARAP) are issued for activities not covered by either of these Acts. TVA has guidelines for this work in the Tennessee River Basin.



The permit issuance component of USACE and the State of Tennessee regulatory review programs could be enhanced with additional funding. Surveillance for unauthorized activities is inadequate. Funds for implementation of BMPs for federal and state projects are included as part of the project. Failure to apply BMPs by the private sector is due to a lack of funds, expertise, and understanding of benefits.

An Interagency Wetlands Committee (IWC) and a technical working group (TWG) was brought together to develop a Tennessee Wetlands Conservation Strategy by the Governor's Environmental Policy Office. The purpose of this committee is to exchange information and coordinate the programs of federal, state, and local agencies, conservation organizations and private landowners to manage conserve or restore wetlands for beneficial uses. The process began in the fall of 1989 and was first published in February 1994 and revised in January 1996. The policy is currently in its third addition published in October 1998. The goal of the State of Tennessee is to provide the maximum practicable wetlands benefits to Tennessee and her citizens by conserving, enhancing, and restoring the acreage, quality, and biological diversity of Tennessee wetlands.

Stream Channel Relocation

Stream channel relocation is covered under regulatory programs of the State of Tennessee. Section 10 (RHA) and/or Section 404 (CWA) cover this activity. State certification under subsection 401 is required for Federal 404 permits. State water quality permits are issued for other activities under the Tennessee Water Quality Control Act (TWQCA) and not covered by either of the Federal Acts.

Inspection and compliance monitoring to ensure implementation of BMPs is limited due to inadequate federal and state funding. Surveillance for non-permitted activities is inadequate. Education of contractors is needed on why BMPs are necessary and which BMPs should be used. All subcontractors should participate in an on-site pre-construction meeting on BMPs.

Additional funding would benefit the federal and state permitting process. State and federal construction projects usually include adequate funds to implement BMPs.

Regulation of stream channel relocation should remain a high priority on a statewide basis with special emphasis in urban areas and new highway corridors.

Channelization

Channelization activities are covered under regulatory programs USACE and the State of Tennessee. Section 10 (RHA) specifically prohibits the unauthorized obstruction or alteration of any navigable water of the U.S. and Section 404 (CWA) regulates the discharge of dredged and fill material into waters of the U.S. State certification under subsection 401 is required for Federal 404 permits. State water quality permits are issued for other activities under the TWQCA, which do not require an individual Federal 404 or Section 10 permit.

Inspection and compliance monitoring is limited by federal and state funding and is estimated to be about 75 percent effective and very limited in surveillance for non-



permitted activities. Contractors need education on why BMPs are necessary and which BMPs should be used. All subcontractors should participate in an on-site pre-construction meeting about BMPs.

Attention to BMPs related to channelization should remain a high priority throughout the state and especially in west Tennessee and metropolitan areas. Efforts should continue to identify and implement alternatives to channelization.

New general permits have been sent out for public review and comment, but have not had a final approval: they are Surveying and Geotechnical Exploration, Minor dredging, Alteration and restoration of intermittent streams for mining, maintenance activities, relocation of intermittent streams, Wetlands restoration and enhancement, and impoundment of intermittent streams.

Lateral Drainage and Maintenance

Lateral drainage is covered under regulatory programs of USACE and the State of Tennessee. Section 10 (RHA) or Section 404 (CWA) cover this activity. State certification under subsection 401 (CWA) is required for Federal 404 permits. State water quality permits are issued for activities not covered by either of these Acts. Federal and state agencies are doing well in implementing BMPs. Ongoing programs of county and city governments are less effective, and those of private landowners and unauthorized work are much less effective. The permit review and issuance component of USACE is adequately funded. However, compliance inspection and enforcement for unauthorized activities is inadequate.

Implementation of BMPs for state and local activities is funded by state and local governments. Failure by the private sector to apply BMPs is due to a lack of funds, expertise, or technical information.

Emphasis should be in counties that border the Tennessee River and should include counties westward to the Mississippi River.

Sand and Gravel Dredging

Section 10 (RHA) and Section 404 (CWA) apply to sand and gravel dredging in navigable waters; therefore, such activities require permit authorization under USACE's regulatory program. Also, in accordance with revisions to 330 CFR Part 323.2, effective September 25, 1993, excavation activities that destroy or degrade areas of waters of the US (i.e., cause an identifiable individual or cumulative adverse effect on any aquatic function) are considered discharges of dredged or fill material under the CWA. Accordingly, such excavation activities in all waters of the U.S. require permit authorization from USACE pursuant to Section 404 of this act. As stated previously, Section 401 certification from the State is required for work that requires an individual USACE permit under Section 404.

Sand and gravel dredging does occur in East Tennessee. While gravel excavation activities for farm, residential, or commercial purposes in smaller streams are less common in this part of the state, numerous applications are received.



Maintenance Dredging

Section 10 (RHA) governs maintenance and dredging for navigation. Certain activities, i.e. maintenance associated with recreation navigation, may be approved under a nationwide permit while other activities are subject to individual permit evaluation. If a nationwide permit is applicable, a state water quality permit may also be required. If an individual permit is required, formal section 401 certification is also required.

Bank Stabilization

Section 10 (RHA) and Section 404 (CWA) apply to bank stabilization activities. Certain relatively small projects, i.e. involving not more than 1000 linear feet of bank, where the length of the stream bank treated is less than three times the top-of-bank width of the stream channel and not more than 10 cubic yards of material placed below the normal waterline, have been previously authorized under nationwide permit, providing certain conditions are met. Longer projects require an application to the USACE. A separate state water quality permit is required for bank stabilization.

Soil Stabilization Measures for Low-Head Impoundments Structures and Dams

Construction of low-head impoundment structures and dams is covered by regulatory programs of USACE of Engineers and the State of Tennessee. The RHA applies to the construction of such structures on navigable waters, while Section 404 (CWA) applies to the discharge of fill material involved in the construction of such structures in *all* waters of the US. State certification under subsection 401 (CWA) is required for Federal 404 permits. State water quality permits are issued for activities not requiring an individual Federal 404 or Section 10 permit. Federal construction agencies such as USACE, TVA, and NRCS have erosion control guidelines which must be followed during construction.

Funding for soil stabilization measures is provided in the overall funding for a project. There is likely to be little activity in this area in the future as large federal dam construction agencies have moved from building new projects to operating and maintaining existing facilities.

Flow Modification and Regulation

Reservoir Releases and Tailwaters

Implementation of BMPs for federal dams up to this time has been on a voluntary basis. The 1987 CWA, Section 524, instructs state and federal agencies to research the water quality problems associated with dam releases, and to develop better methods of improving tailwater quality. Non-federal dams are required to implement BMPs when undergoing re-licensing by FERC. In 1996 TVA completed a five year Lake Improvement Program to develop, assess and implement BMPs. BMPs have been implemented at 12 dams for minimum flow and 10 dams for dissolved oxygen. USACE has designed one DO improvement technique at a dam in middle Tennessee and operates mainstem dams and three tributary dams to improve dissolved oxygen in reservoir releases. USACE Waterways Experiment Station is conducting research on techniques for increasing DO. Funding is a constraining factor in USACE efforts. Continued operation and maintenance of existing BMPs, and improvement in quantity and quality of reservoir releases should be a high priority for TVA and USACE.



TVA should continue to operate and maintain systems implemented under the Lake Improvement Plan and achieve minimum flows at 12 dams, and dissolved oxygen targets at 10 dams in Tennessee. TVA should continue to explore opportunities to utilize aerating turbine technology where turbine units will be replaced in the future.

BMPs for addressing water quality and aquatic habitat problems have been identified by USACE. Implementation of these BMPs needs a stronger emphasis within USACE in order to secure funding and resources. Unfortunately, USACE budget process does not have the flexibility of TVA's, where the majority of restoration efforts are funded directly from the power program. Funding for BMP implementation must be requested from congressional appropriations. A stronger emphasis from outside agencies (TDEC, TWRA, TDA-NPS) for complying with water quality criteria below USACE projects is needed to ensure that funding is secured to implement these BMPs.

There is a need for coordinated watershed management to minimize impacts from current and future urbanization. Improvement requires a comprehensive enforcement of existing erosion control ordinances and stormwater permits by local and state agencies. To be successful, this management must have support at the local city and county government level. Restoration efforts are needed to improve impacts from previous development including riparian zone restoration and stabilization of stream banks and stormwater conveyances.

COOPERATING PARTNER

Partners

Austin Peay State University
 Five Rivers Resource and Development Districts Council
 Knoxville Water Quality Forum
 Tennessee Association of Conservation Districts
 Tennessee Department of Agriculture
 Ag Resource Conservation Fund
 Tennessee Department of Environment and Conservation
 Environmental Planning Office
 Tennessee Department of Environment and Conservation
 Division of Natural Heritage
 Division of Water Pollution Control
 West Tennessee River Basin Authority
 Tennessee Department of Transportation
 Tennessee Technological University
 Tennessee Valley Authority
 Tennessee Wildlife Resources Agency
 University of Tennessee Water Resources Center
 USDA:
 Natural Resources Conservation Service
 Farm Services Agency
 US Army Corps of Engineers

Abbreviation

APSU
 FRRC&D
 KWQF
 TACD
 TDA
 ARC
 TDEC
 EPO
 TDEC
 NH
 WPC
 WTRBA
 TDOT
 TTU
 TVA
 TWRA
 UTWRC
 USDA
 NRCS
 FSA
 USACE



PARTNER DESCRIPTION & ENFORCEMENT MECHANISMS

Several agencies have programs to control NPS pollution resulting from Hydrologic Modification and Construction activities. These agencies include USACE, TVA, TDOT, and TDEC. The following discussion describes the responsibilities and programs of each of these agencies.

Tennessee Association of Conservation Districts (TACD)

TACD represents the 95 conservation districts across the state. The TDA NPS Program and ARC fund has had many contracts with them for BMP implementation and nps education.

The United States Army Corps of Engineers (USACE)

The USACE regulates activities in navigable waters of the U.S. under the Rivers and Harbors Act of 1899 (RHA). The Act prohibits the unauthorized obstruction or alteration of any navigable water of the U.S.

Navigable waters of the US are those waters that are presently used or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Jurisdiction of USACE over navigable waters of the US extends laterally to the elevation of ordinary high water on non-tidal streams and lakes.

All work performed on, over, or under navigable waters requires review and permit authorization under the Act, with the exception of bridges and causeways that must be approved by the U.S. Coast Guard. Examples of work requiring approval include mooring cells and dolphins, commercial barge docks, breakwaters, recreational docks and piers, launching ramps, aerial power line crossings, submarine pipeline crossings, dredging, fills, riprap, retaining walls, intakes, and outfalls.

Section 404 of the Clean Water Act (CWA) regulates any discharge of dredged or fill material into *all* waters of the US, including wetlands. The act authorizes the USACE to issue permits for discharges of fill material in waters after appropriate public review, which may include issuance of public notices. The Environmental Protection Agency (EPA) has oversight of the Section 404 Program and can restrict discharges into certain areas after compliance with established procedures.

Section 404 permit conditions, negotiated in cooperation with other federal and state agencies, may provide control of nps pollution. The Tennessee Division of Water Pollution Control (WPC) has the authority to issue or deny Section 401 Certification of 404 permits, and may refuse to certify a project because it would violate provisions of the Tennessee Water Quality Control Act of 1977 (TWQCA).

USACE permits are normally issued for a period of three years. USACE uses various means to determine when permitted activities are commenced and completed. When a project has been completed, a follow-up compliance inspection may be conducted to ensure that the work has been constructed, and is being maintained, according to approved plans and permit conditions. Priority is given to the inspection of major projects that have more potential for adverse aquatic impacts.



Nashville District (USACE)

The Nashville District has performed several bank stabilization projects under the Continuing Authorities Program. Section 14 of the Flood control Act of 1948 allows the USACE to assist local improvements by planning designing and constructing stream bank protection to halt erosion where it is threatening publicly owned facilities that can not be reasonably relocated.

USACE, under the authority of its regulatory program, does not provide financial assistance to the applicant.

The Nashville District operates a system of ten water resource projects on the Cumberland River in Tennessee and Kentucky. Implementing BMPs in these reservoirs requires coordination and funding from various USACE operational groups that may be affected by the BMPs. Beginning in 1970, USACE began monitoring and documenting water quality conditions within the Cumberland River Basin. Research on methods to improve conditions has been performed both within USACE (including the Waterways Experiment Station) and by agencies with similar problems, such as TVA and the Bureau of Reclamation

The Cumberland River reservoirs can be broadly grouped into two categories based on morphological and hydrologic characteristics: (1) mainstem Cumberland River reservoirs and (2) tributary storage reservoirs. The operation of USACE reservoirs for originally-authorized purposes, such as hydropower and flood control, has both localized and cumulative effects. Cumulative effects are the relationships between the operation of upstream tributary reservoirs and water quality conditions in downstream mainstem reservoirs.

Recent evaluations identify BMPs for addressing water quality problems that cannot be addressed by operational changes alone. A brief description of efforts currently in operation at USACE reservoirs in 1) mainstem Cumberland River reservoirs, 2) Cumberland River tributary storage reservoirs, and 3) related watershed evaluations is summarized below.

Mainstem Cumberland River Reservoirs

The mainstem reservoirs are Cordell Hull, Old Hickory, Cheatham, and Barkley (KY-TN). The operation of the Cumberland River system has been evaluated to determine flow requirements to maintain dissolved oxygen (DO) levels in mainstem reservoir releases. Water quality conditions in mainstem reservoirs are largely controlled by travel times through the lakes, which is related to DO depletion. Old Hickory Dam is generally the control point for DO levels for mainstem river projects. Seasonal flow criteria has been implemented to prevent violations of DO criteria (5 mg/l) below Old Hickory Dam. Real-time information and modeling are periodically evaluated to ensure current conditions are satisfactory. Consequently, violations at the other mainstem projects are avoided. The tributary storage reservoirs are Center Hill, Dale Hollow and J. Percy Priest.



Center Hill and Dale Hollow Dams

During 1997, particularly severe dissolved oxygen (DO) problems were observed at both Center Hill and Dale Hollow lakes. These conditions were the result of late spring rains that caused a significant volume of cold, oxygenated water that had been stored over the winter to be evacuated. This high quality water was replaced with warmer, nutrient laden water from the runoff which ultimately exacerbated the DO depletion in the two lakes.

In 1997 DO levels in the releases from Center Hill Dam fell below 6 mg/l by mid summer and reached a minimum of about 1 mg/l in early October. In an effort to improve DO conditions in the tailwater reach hydropower generation was limited to 78% of capacity during this period of stressed DO conditions. This special operation, which results in more air being entrained in the power releases, continued until early December.

At Dale Hollow, DO levels in the hydropower releases declined throughout the summer reaching a minimum of 2 mg/l in late September. Power generation was limited to 61% of capacity during this period, which improved release quality by 0.5 to 1.7 mg/l depending upon flow conditions and reservoir water quality. This special operation was maintained until mid-November.

The USACE carried out extensive studies designed to quantify the extent and severity of low DO in the Center Hill and Dale Hollow tailwaters. These surveys, conducted during the fall of 1997, indicated the low DO problems affect more extensive reaches, more profoundly, than previously assumed.

During 1998, some progress was made by the USACE in implementing measures to improve outflow DO from Center Hill and Dale Hollow dams. One turbine was outfitted at Center Hill with hub baffles, and studies were initiated at Dale Hollow to investigate measures to improve outflow DO.

1998 was also a severe year for DO depletion at both Center Hill and Dale Hollow. At Center Hill, DO in the releases dropped to about 4 mg/l by late July. Power generation was limited to about 80% of capacity. This caused an increase of approximately 0.5 mg/l in average daily outflow DO. The operating restrictions were lifted in early December 1998 after the lake destratified.

At Dale Hollow DO levels also fell to about 4 mg/l by late July. Power generation was limited to 60% of capacity. This improved the average daily outflow DO by about 1.0 mg/l. The operating restrictions were lifted in early December 1998.

The year 1999 was not as severe a year for DO depletion as 1997 or 1998. At Center Hill, a restricted capacity operation was used between September and late November. Priority was given to operating with the unit equipped with hub baffles. At Dale Hollow, power generation was restricted to 60% of capacity in early September. One unit at Dale Hollow had recently been outfitted with hub baffles and priority was given to operating with this unit. The reduced capacity operation at Dale Hollow ended in late November 1999.



Concerning the minimum flow issue below Center Hill, a proposed weir about two miles downstream from the dam was canceled for engineering and environmental reasons. However, the USACE is investigating other options to provide a continuous minimum flow in the tailwater. Studies continue and no final recommendations have been made as yet.

J. Percy Priest

At J. Percy Priest in recent years studies have been conducted into methods for improving the seasonal DO depletion in hypolimnetic waters in the dam's forebay. The most promising remedy is some kind of oxygen injection system. At this point both line diffuser and inverted oxygen cone systems are being actively evaluated. A funding mechanism for operating an oxygen system has not been secured either.

Note that during 1998 the single turbine at J. Percy Priest Dam was taken out of service part of the year. As a result, from July through December, releases were made through the spillway. This maintained DO levels in excess of 7 mg/l. With the return of the unit to service, the spillway releases were suspended.

Watershed Evaluations

The USACE is actively involved in evaluating watershed problems, particularly in the Nashville area. Many instances of construction activities with inadequate BMPs have been observed. There is a general lack of awareness of water quality impacts from urbanization in streams and downstream lakes. Requirements of the NPDES stormwater permits for construction sites greater than five acres have been largely ignored. This aggravates problems with reservoir releases by exacerbating DO depletion within the reservoirs. This problem is more significant in the watersheds surrounding J. Percy Priest, Old Hickory, and Center Hill Lakes.

In addition to active construction activities, existing development can induce changes in hydrologic regime and sediment load with resulting channel instability. These types of problems are evident in many locations around Nashville.

Tennessee Valley Authority

TVA is a federal agency that operates and manages the dams and reservoirs on the Tennessee River system for multipurpose development. The following programs cover activities associated with hydrologic modification and construction activities:

Section 26a Review and Approvals--Section 26a of the TVA Act requires that TVA's approval be obtained prior to the construction, operation, or maintenance of any dam, appurtenant works, or other obstruction affecting navigation, flood control, or public lands and reservations across, along, or in the Tennessee River or any of its tributaries. Such obstructions include, but are not limited to, boat docks, piers, boat houses, rafts, buoys, floats, boat-launching ramps, bridges, aerial utility crossings, and fills.



If the construction, maintenance, or operation of a proposed facility or structure, or any part thereof for which approval is sought may result in any discharge into navigable waters of the US, the applicant must also submit a certification in accordance with Section 401 CWA. This certification documents, with reasonable assurance, that the proposed activity will not violate applicable water quality standards.

It is required that all land-disturbing activities be conducted in accordance with Section 208 CWA, and that BMPs to control erosion and sedimentation be implemented to prevent adverse water quality and related aquatic impacts. The applicant must provide an erosion and sediment control plan for projects, activities, or actions that, in TVA's judgment, have the potential for a substantial adverse impact.

A number of federal (USACE, EPA, U.S. Coast Guard, etc.) and state programs regulate some of the activities that are covered under Section 26a. However, no program, other than statutory authority, expressly mandates the consideration of the three areas specified in Section 26a of the TVA Act (navigation, flood control, and public lands or reservations) in terms of the unified development and regulation of the Tennessee River and its tributaries. TVA cooperates closely with other agencies having similar regulatory responsibilities. Such cooperation between USACE and TVA has substantially improved understandings between the agencies, increased the opportunity for public input to the review and approval process, and reduced the paperwork burden placed on Section 26a applicants.

Lake Improvement Plan

TVA has completed a five-year Lake Improvement Plan. The plan was to improve the quality of the tailwater releases by improving DO levels in releases from TVA dams and enhancing and/or stabilizing flows below TVA dams.

Flow releases from TVA dams were generally low in DO during much of the traditional recreation season that extends from May through October. In addition, these releases were intermittent resulting in dry streams below the tributary dams for extended periods of time. Consequently, the tailwaters below the tributary dams had not retained their inherent potential to generate recreation and fishing benefits and to provide economic support to communities located along the streams. To explore ways to enhance water quality (primarily DO) and water supply, TVA undertook an extensive study and testing program in 1980.

A brief description of accomplishments at specific TVA dams in Tennessee since implementation of the Lake Improvement Plan is described below.



Minimum Flow Systems

Minimum flow systems have been implemented at 12 dams using three technologies. These water quality improvements will help in the recovery of aquatic habitat lost to intermittent drying of the river bed.

- Re-regulation weirs - (2) South Holston and Norris
- Small hydropower units - (1) Tims Ford
- Turbine pulsing operations - (9) Wilbur, Cherokee, Fort Patrick Henry, Douglas, Appalachia (dam located at Tennessee-North Carolina state line), USACE No. 1, Boone, Chickamauga, and Pickwick.

Aeration Systems

Aeration systems have been implemented at 10 dams to meet TVA dissolved oxygen targets. Multiple systems are required at some projects to attain desired results.

- Oxygen injection - (5) Cherokee, Douglas, Fort Loudoun, Tims Ford, and Watts Bar
- Surface water pumps - (2) Cherokee and Douglas
- Aeration weirs - (1) South Holston
- Air compressors - (1) Tims Ford
- Turbine venting systems - (4) Boone, South Holston, Appalachia, and Watauga
- Aerating Turbine - (1) Norris

These systems performed well and reduced the number of days DO concentrations were below target by more than 80%. Stream bioassessments in the TVA tailwaters confirm that increased streamflows and dissolved oxygen concentrations have improved fish and aquatic life.

Tennessee Department of Environment and Conservation (TDEC)

State water pollution control regulatory programs are authorized by the Tennessee Water Quality Control Act of 1977, (T.C.A. 69-3-101, et seq.). Tennessee Division of Water Pollution Control (WPC) has the responsibility of requiring permits for projects that physically alter waters of the state, such as gravel dredging, some water withdrawals, impoundments, and channel-alteration activities. A summary of specific programs within WPC that address activities related to NPS pollution follows.

State Water Quality Permit

Since the 1971 Water Quality Control Act was passed, WPC issues water quality permits for a variety of activities that may impact the waters of the state, but do not have a point source discharge and are not covered by the NPDES program. Examples of these activities include sand and gravel dredging not requiring an individual Federal 404 (CWA) or Section 10 (RHA) permit, bridge construction, clearing and snagging in streams for debris removal, and stream channel alterations.

In 1985 the establishment of the ARAP program improved consistency and uniformity of water quality permitting. Twelve General Permits have been established to address the following activities: launching ramp construction; alteration of wet weather conveyances; minor road crossings; utility line



crossings; stream bank stabilization; sand and gravel dredging; debris removal; emergency road repair; stream restoration and enhancement; minor wetlands alterations; bridge scour repair; and application of herbicides in aquatic systems. General permits specify circumstances under which each applies, and establish conditions equivalent to BMPs that must be followed for an activity to be authorized by the general permit. Other alterations may be authorized by individual ARAPs. The intent of all permits is to maintain the ability of the state's waters to support classified uses.

The intent of all permits is to maintain the ability of the state's waters to support classified uses. ARAP Handbook:

<http://www.state.tn.us/environment/permits/handbook/arap.htm>.

Certification of Federal Permits

In addition to state permits, WPC processes Section 401 water quality certifications, as required by the CWA. Certifications are for federal permits issued by USACE, the US Coast Guard, FERC, and TVA. Most federal permit reviews are of USACE Section 404 permits for discharge of dredged or fill materials associated with stream relocations and channelization, work in wetlands, bridge construction and commercial and recreational dock facilities. Through the conditions of these permits, WPC regulates nps pollution from activities involving the deposition of fill material in waters of the state, including wetlands.

TDEC Strategic Plan

In January 1999, TDEC initiated a 4-year Strategic Plan. Goal 1 of the strategy states that the department will protect, preserve and improve the quality of Tennessee's air, land and water.

Objective 1-C Protect and enhance Tennessee's rivers, lakes, wetlands and ground water to ensure a healthy environment.

1-C-1: Complete the assessment and prioritization of 32 watersheds under the Department's water quality management plan by January 1, 2003

1-C-3: By January 1, 2003, develop control strategies on 100 streams that are listed on the 303(d) list of stream that are not achieving compliance with at least one use classification in conjunction with state and federal partners.

1-C-6: Achieve no net loss of wetlands over the next four years.

1-C-7: Restore 70,000 acres of wetlands by June 30, 2000 (compared to 1994).

1-C-9: Monitor water quality of rivers, lakes, wetlands, and ground water and report annually on improvements in water quality conditions throughout the state.

Tennessee Department of Environment and Conservation: West Tennessee River Basin Authority (WTRBA)

The WTRBA, formerly the Obion-Forked Deer Basin Authority, was formed in 1996. The WTRB expanded scope now includes other waters, notably the Hatchie River. The WTRB primary purpose is to preserve the natural flow and function of the Hatchie, Obion and Forked Deer River Basins through environmentally sensitive stream maintenance, and appropriate conservation practices in upland settings. The geographic area of responsibility includes all or part of seventeen counties in West Tennessee.



The WTRB is charged with maintaining and stabilizing the function of channelized streams and rivers where the land use is well established and for which restoration of natural stream or river function is not practicable. Likewise the WTRB will, where practicable, restore natural stream and floodplain dynamics and associated economic benefits such as fisheries and wildlife habitat, wetlands, water quality, and naturally or economically productive bottomland hardwood forests.

Tennessee Department of Transportation (TDOT)

TDOT is governed by both federal and state rules and regulations in the planning, design, and construction of highways, bridges and culverts. The department, operates under the guidelines in Standard Specifications for Road and Bridge Construction, and implements provisions contained in A Policy on Geometric Design of Highways and Streets, Best Management Practices for Erosion and Sediment Control, the Tennessee Water Quality Control Act, Section 404 (CWA), and other federal regulations. TDOT is presently using BMPs to control nps pollution from highway and bridge construction as described in Reducing Nonpoint Source Water Pollution by Preventing Soil Erosion and Controlling Sediment on Construction Sites: A Training Manual for Construction Inspection Personnel. The department also conducts regional workshops annually to discuss construction practices and problems encountered in highway and bridge construction.

The guidelines to be followed by the project engineer and the contractor in the construction of highways and bridges are outlined in Standard Specifications for Road and Bridge Construction. "Section 209 - Project Erosion and Siltation Control" in the manual details specific measures to be used to control sediment on highway projects.

In the development of project plans, the design engineer, uses as a guide A Policy on Geometric Design of Highways and Streets developed by the American Association of State Highway and Transportation Officials. The designer also uses Design Guidelines and Instructional Bulletins, Standard Roadway Structures Drawings, and Erosion and Sediment Control Guidelines developed by TDOT. These manuals and guidelines describe in detail appropriate methods of erosion control during construction.

The designer uses these guidelines and field information to plot the drainage patterns associated with the project and to develop the erosion control plan that is incorporated into the construction plans. Appropriate notes are included on the plan sheets as guidance for the contractor in implementing the plan. It is the responsibility of the assigned project engineer to ensure that the erosion control plan is implemented. Any improvements or adjustments to the erosion control plan are made at the discretion of the project engineer.

All grade and drain projects crossing "blue line" streams or impacting jurisdictional wetlands require a Section 404 (CWA) Permit. Any construction project that impacts waters of the state requires a state water quality permit (ARAP or 401 Certification) under the TWQCA. Any construction project that disturbs more than 5 acres of land requires a NPDES permit. These permits require the implementation of BMPs to control erosion and minimize pollution.



TDOT has a Technology Transfer and Research Program through which the department tests new materials, develops training courses and manuals, and conducts research that will benefit the TDOT in constructing a safe, efficient, and environmentally-sensitive transportation system.

In 1992, TDOT conducted several workshops on the proper installation and maintenance of soil erosion and sediment controls. The workshops were conducted at each regional office and attended by over 600 construction personnel, including TDOT project inspectors. In 1993 and 1994 TDOT developed additional training courses for design and construction personnel in the sizing and designing of erosion controls for construction projects. The workshops were attended by over 800 TDOT personnel, contractors and consultants.

A new Environmental Coordinator position has been established in each of TDOT's regional offices across the state. The Environmental Coordinator is responsible for reviewing erosion control plans and making on-site inspections to ensure that erosion controls are implemented and properly installed.

OTHER FUNDING SOURCES

Additional funding sources for environmental projects are listed in the Catalog of Federal Funding, which can be found at: www.aspe.os.dhhs.gov/cfda

CURRENT 319 PROJECTS

Tennessee Department of Environment and Conservation-Division of Natural Heritage and TDA-Nonpoint Source Program

418 acres of wetlands in the Ghost River Section of the Wolf River were purchased in coordination with the Wolf River Conservation Initiative: \$2,500 of 319(h) and \$284,755 Match monies were provided by TDEC-DNH. TWRA and TNC were also partners in development of this project.

Five Rivers Resource Conservation & Development Council: Yellow Creek Project

Six streambank bioengineering restoration projects were established in the Yellow Creek watershed, Dickson County. A Landowner's Guide to Streambank Protection and Stabilization brochure and a video were also developed in partnership with TDEC, TWRA, NRCS.

<http://www.state.tn.us/environment/epo/strmbank.htm>.

Rhea County Soil Conservation District: Piney Creek Streambank Project

A streambank bioengineering restoration demonstration project was constructed on the bank of Piney Creek at Veteran's Park, Spring City, TN. A demonstration day was held March 23, 2000 partnering with NRCS, City of Spring City, TN, and Rhea County.



Great Smokey Mountain National Park: Streambank Restoration Demonstration Project

A streambank restoration project was established on Abram's Creek in Cades Cove section of the Park. Several types of restoration material were demonstrated. A two-day hands-on workshop was held along with a workshop with the participants doing a majority of the work.

University of Tennessee, Water Resources Center along with Knoxville Water Quality Forum: Second Creek Project.

Four streambank restoration projects were established with this project.

A two day training workshop was held on March 25-26, 1998 as part of site 1 restoration. Over 45 people attended and received hands-on training in soil bioengineering and restoration techniques on day two. A manual was also developed. The four sites were:

1. Inskip ball field: a 300 ft. section of streambank was stabilized and revegetated using soil bioengineering.
2. Goose Creek @ Mary Vestal Park: approximately 600 ft. of streambank were stabilized and revegetated using a variety of soil bioengineering techniques and native plants.
3. First Creek along the greenway in North Knoxville. The streambank stabilization work was completed in May 1998.
4. Love Creek Restoration at Holston Middle School site, February – May 1999.

**Austin Peay State University, Center for Field Biology:
West Sandy Project:**

A series of low head log dams were installed along with in-stream log weirs and beaver dam levelers were demonstrated. A Riparian Streambank Restoration Conference was held in association with this project also.

Sulphur Fork Creek Project:

Plans are to apply bioengineering to stabilize streambanks as well as eroding ditches in this project.

Friends of the North Chickamauga Creek Conservancy

A stream bank restoration project was done in the lower half of the North Chickamauga Creek watershed. The project involved assistance from at least seven local, state, and federal agencies including some sixty resource experts and numerous citizen. Since the construction, one landowner workshop and at least 6 field days have been held at the site.

Tennessee Technology University along with Hull York Lakeland RC&D Council, city of Cookeville and NRCS

A lake bank restoration project was established at Cane Creek Park Lake in Cookeville, TN. It involved installation of wave action retardant devices as well as low-lying vegetation to stabilize a section of the lake bank along a walking trail. 110 feet of coconut biolog fiber roll with live stakes were installed along with 110 feet of live stakes and riprap. In addition, signs have been designed to be installed along a walking trail, at the lake, discussing the restoration techniques and nps pollution. Several tours will be held at the site to demonstrate the restoration techniques.



Heavy use area protection and stream crossing project: DeKalb Soil Conservation District

A combined heavy use and stream crossing was installed in DeKalb County. Along with it, an information brochure was developed and a field day was held at the site.

Hamblin and Hawkins Soil Conservation District FY-95 Bent Creek

With technical assistance of NRCS, 3,000 feet of stream bank restoration and two acres of tree plantings have been funded as part of the FY-95 NPS Bent Creek Project.

Master Degree Study entitled “Water Quality and Ecological Impacts of Watering Cattle Adjacent to a Small Middle Tennessee Stream” by Jeff Powell, December 1998.

In this study, three practices were compared: at site 1) cattle with “no access” to the stream were given an alternative water source; at site 2) cattle had access to an “improved” area stream crossing; and at site 3) cattle had “free access” to the stream. Results show statistically significant differences ($\alpha=0.05$) in nitrate, ammonia, and fecal coliform bacterial levels where cattle had free access to the stream. In areas where cattle were completely restricted, or had limited access to the stream, significant differences were only detected for nitrate, when compared to the Control. Research indicated that statistically significant differences in water quality could be achieved by restricting and/or limiting cattle access to streams.

Unified Watershed Assessment Projects

In the FY-2000 UWA projects, there is potential for streambank restoration projects in four watersheds: Hatchie watershed: Cypress Creek; Hiwassee watershed: Oostanaula above Athens; French Broad watershed: Dunn Creek and East Fork Creek and Watauga watershed: Roan Creek.

319 Projects Involving Hydrologic Modification

Grant Yr.	Project Title	Location
FY-94	West Sandy Watershed Project	West Sandy Creek
FY-95	Bent Creek	Bent Creek Watershed
FY-96	UT Urban Manual/workshop (phase I)	statewide
FY-98	UT Urban Manual/workshop (phase II)	statewide
FY-98	Grant Pool	303(d) streams
FY-99	Grant Pool	303(d) streams
FY-99	Five Rivers: Urban NPS Demo & Education	Red River: Sulphur Fork Creek: Harpeth River, Duck, Buffalo River, Yellow Creek, Hurricane Creek and Jones Creek
FY-99	Smokey Mountains: TN Valley Urban NPS	Nolichucky River, French Broad River, Holston River, Little Tennessee



		River, Little River
FY-2000	OHV: Off-Road Vehicles Committee	Statewide

Tennessee Wetlands Acquisition, Restoration and Management by partners:

Wetlands Acquired by TWRA Wetlands Acquisition Funding 1986 through 8-31-99: 44,681 acres
Wetlands Enrolled in USDA in Tennessee in the Wetlands Reserve Program 1994-98 (restored wetlands under permanent and 30 year conservation easements): Permanent restored wetlands 5,047 acres permanent restorable wetlands 1,540 acres 30 year conservation easements restored 30 acres 30 year conservation easements restorable 751 acres <i>(est. FY-99 30yr restorable = 210ac; permanent restorable = 1,162 acres)</i>

AREAS FOR PROGRAM EXPANSION

- Increase education efforts focused towards the river functions and their association with surface water quality.
- Develop statewide public awareness campaigns reaching property owners, construction companies, developers, city, and county officials.
- Work with county governments to initiate programs addressing environmentally sensitive land use and development.
- Target 303(d) streams with Grant Pool money that have construction as source of pollution.

MEASURES OF SUCCESS

- All streams that are on the 303(d) list because of hydrologic modification have been taken off the list and none are being added.
- Increase the number of people that realize the importance of stable functioning streams and wetlands and their association with land use and water quality.
- Continual increase of wetlands protected, restored and/or put into a reserve program.
- Increase the number of developments, i.e. private, state and commercial that take into consideration the hydrology of the area and builds to retain pre-development hydrology.

MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, to strengthen existing partnerships and to foster greater trust, commitment and accountability.

- **Action 1:** The Construction-Hydrologic Modification Working Group (CHWG) will meet semi-annually.
Lead: TDA-NPS Program
Key partners: TDEC-EPO-WPC-WTRBA, TVA, TDOT, USACE, USDA, TNRC&D, FHA, UTWRRC, TTU, APSU, KWQF, TWRA, Consultant firms
Year(s): 2001 – 2005
- **Action 2:** Increase CHWG membership by one member each year.
Lead: TDA-NPS Program
Key partners: TDEC-EPO-WPC-WTRBA, TVA, TDOT, USACE, USDA, TNRC&D, FHA, UTWRRC, TTU, APSU, KWQF, TWRA, Consultant firms
Year(s): 2001 – 2005
- **Action 3:** Establish a CHWG mission statement, a list of collective capabilities, and priorities for funding.
Lead: CHWG
Key partners: TDA-NPS Program, TDEC-EPO-WPC-WTRBA, TVA, TDOT, USACE, USDA, TNRC&D, FHA, UTWRRC, TTU, APSU, KWQF, TWRA, Consultant firms
Year(s): 2001-2005
- **Action 4:** Work with other agencies to develop Hydrologic Modification projects.
Lead: CHWG
Key partners: TDA-NPS Program, TDEC-EPO-WPC-WTRBA, TVA, TDOT, USACE, USDA, TNRC&D, FHA, UTWRRC, TTU, APSU, KWQF, TWRA, Consultant firms
Year(s): 2001-2005
- **Action 5:** Develop Memoranda of Agreement with key federal agencies to improve programmatic consistency.
Lead: TDA-NPS Program
Key Partners: All federal agency partners
Year(s): 2001-2005

Long Term Goal 2.

Fully implement all developed TMDLs for nonpoint sources in compliance with existing regulations, policies, or agreements by 2015.

Refer to Chapter 1.11, TMDL Implementation for specific action items related to this Long Term Goal.

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- **Action 1:** 20% of the streams impaired due to hydrologic modification on the 1998 303(d) List will support their designated uses.
Lead Agencies: TDA-NPS Program
Key partners: TDA-NPS Program, TDEC-WPC, TVA, USACE, USDA, TNRC&D, UTRRC, TTU, APSU, KWQF, Consultant firms
Year(s): 2005
- **Action 2:** 40% of the streams impaired due to hydrologic modification on the 1998 303(d) List will support their designated uses.
Lead: TDA-NPS Program
Key partners: TDA-NPS Program, TDEC-WPCTVA, USACE, USDA, TNRC&D, UTRRC, TTU, APSU, KWQF, Consultant firms
Year(s): 2010
- **Action 3:** 60% of the streams impaired due to hydrologic modification on the 1998 303(d) List will support their designated uses.
Lead Agencies: TDA-NPS Program
Key partners: TDA-NPS Program, TDEC-WPC, TVA, USACE, USDA, TNRC&D, UTRRC, TTU, APSU, KWQF, Consultant firms
Year(s): 2015
- **Action 4:** Develop at least two projects that addresses hydrologic modification 303(d) streams for 319 funded projects.
Lead: TDA-NPS Program
Key partners: TDA-NPS Program, TDEC-EPO-WPC-WTRBA, TVA, TDOT, USACE, USDA, TNRC&D, FHA, UTRRC, TTU, APSU, KWQF, TWRA, Consultant firms
Year(s): 2001-2005
- **Action 5:** Continue operation and maintenance of dissolved oxygen and aeration systems, minimum flows at dams installed under TVA's Lake Improvement Plan in the Tennessee River Watershed.
Lead: TVA
Key partners: TDA-NPS Program, TDEC-EPO-WPC-WTRBA, TVA, TDOT, USACE, USDA, TNRC&D, FHA, UTRRC, TTU, APSU, KWQF, TWRA, Consultant firms
Year(s): 2001-2015
- **Action 6:** Develop comprehensive tailwater and water quantity released management strategy for USACE reservoirs.
Lead: USACE



- Key partners: TDA-NPS Program, TDEC-EPO-WPC-WTRBA, TVA, TDOT, USACE, USDA, TNRC&D, FHA, UTRC, TTU, APSU, KWQF, TWRA, Consultant firms
- Year(s): 2001-2005
- **Action 7:** Install hub baffles, dissolved oxygen, and supplemental air systems on The Cumberland River: one unit at each dam.
Lead: USACE
Key partners: TDA-NPS Program, TDEC-EPO-WPC-WTRBA, TVA, TDOT, USACE, USDA, TNRC&D, FHA, UTRC, TTU, APSU, KWQF, TWRA, Consultant firms
Year(s): 2001-2005
 - **Action 8:** As part of hydropower upgrade, investigate autoventing turbines.
Lead: USACE
Key partners: TDA-NPS Program, TDEC-EPO-WPC-WTRBA, TVA, TDOT, USACE, USDA, TNRC&D, FHA, UTRC, TTU, APSU, KWQF, TWRA, Consultant firms
Year(s): 2001-2005
 - **Action 9:** On J. Percy Priest Dam, evaluate hypolimnetic oxygen systems to address the build-up of anoxic products in the forebay and to improve release water quality.
Lead: USACE
Key partners: TDA-NPS Program, TDEC-EPO-WPC-WTRBA, TVA, TDOT, USACE, USDA, TNRC&D, FHA, UTRC, TTU, APSU, KWQF, TWRA, Consultant firms
Year(s): 2001-2005
 - **Action 10:** Provide continuous flow of 200 cfs at Center Hill Dam Design and construct re-regulation weir.
Lead: USACE
Key partners: TDA-NPS Program, TDEC-EPO-WPC-WTRBA, TVA, TDOT, USACE, USDA, TNRC&D, FHA, UTRC, TTU, APSU, KWQF, TWRA, Consultant firms
Year(s): 2001-2005
 - **Action 11:** Implement and evaluate turbine venting on at least one unit, and preferably, on all unit projects on Center Hill and Dale Hollow Dams.
Lead: USACE
Key partners: TDA-NPS Program, TDEC-EPO-WPC-WTRBA, TVA, TDOT, USACE, USDA, TNRC&D, FHA, UTRC, TTU, APSU, KWQF, TWRA, Consultant firms
Year(s): 2001-2005



Long Term Goal 4.

Beginning in 2006, through regulatory and non-regulatory means, prevent previously unlisted waters from being included on the 303(d) List because of nonpoint source impairments.

- **Action 1:** Meet with organizations in an effort to increase level of evaluation, speed permit processing, and strengthen surveillance, compliance, and enforcement regulatory programs.
Leads: TDEC-WPC, TDA-NPS Program
Key partners: TDA-NPS Program, TDEC-EPO-WPC-WTRBA, TVA, TDOT, USACE, USDA, TNRC&D, FHA, UTRRRC, TTU, APSU, KWQF, TWRA, Consultant firms
Year(s): 2001-2005
- **Action 2:** Develop two land easement projects and encourage other 319 projects to develop land easements.
Lead: TDA-NPS Program
Key partners: TDA-NPS Program, TVA, USACE, USDA, TNRC&D, FHA, UTRRRC, TTU, APSU, KWQF, TWRA, Consultant firms
Year(s): 2001-2005
- **Action 3:** Hold a meeting with USDA-FSA to encourage expansion of qualification of buffer set asides.
Lead: TDA-NPS Program
Key partners: TDA-NPS Program, USDA-FSA
Year(s): 2005
- **Action 4:** Establish meaningful state wetlands use classifications and water quality standards.
Lead: TDEC-WPC
Key partners: TDA-NPS Program, TDEC-EPO-WPC, TVA, TDOT, USACE, TNRC&D, UTRRRC, Consultant firms
Year(s): 2005-2015

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution, and how to prevent it.

- **Action 1:** Conduct one workshop for state, local, and federal personnel involved in Stream/flood plain management or in providing of technical assistance to landowners and others on stream management, and flood mitigation issues.
Lead: TDA-NPS Program
Key partners: TDA-NPS Program, TDEC-WPC, TVA, TDOT, USACE, TNRC&D, UTRRRC, TWRA, Consultant firms
Year(s): 2005-2015



- **Action 2:** Develop two Outdoor Classroom projects that incorporate wetland conservation and protection.
Lead: TDA-NPS Program
Key partners: TDA-NPS Program, TDEC-EPO-WPC-WTRBA, TVA, TDOT, MTSU, USACE, USDA, TNRC&D, FHA, UTRRRC, TTU, APSU, KWQF, TWRA, Consultant firms
Year(s): 2005-2005
- **Action 3:** Continue to be a member and participate in the Interagency Wetlands Committee (IWC) and a technical working group (TWG).
Lead: TDEC-EPO
Key partners: TDA-NPS Program, TDEC-WPC-WTRBA, TVA, TDOT, USACE, USDA, TNRC&D, UTRRRC, TTU, APSU, TWRA, Consultant firms
Year(s): 2005-2015
- **Action 4:** Conduct one workshop, with associated literature, bank stabilization, bio-engineering, fluvial geomorphology and riparian zone restoration targeting state, local, and federal personnel or individuals involved in providing technical assistance to landowners.
Lead: TDA-NPS Program
Key partners: TDA-NPS Program, TDEC-WPC, TVA, TDOT, USACE, TNRC&D, UTRRRC, TWRA, Consultant firms
Year(s): 2005-2015
- **Action 5:** Develop a focused awareness campaign on water supply and water withdrawal issues reaching property owners, construction companies, developers, city, and county officials.
Lead: TDA-NPS Program
Key partners: TDA-NPS Program, TDEC-EPO-WPC, TVA, TDOT, USACE, TNRC&D, UTRRRC, Consultant firms
Year(s): 2005-2010
- **Action 6:** Meet with involved organizations to investigate the possibility of TDA-NPS Program using (TDEC – TDOT stream culvert) mitigation money to fund stream restoration BMPs.
Leads: TDEC-WPC, TDOT and TDA-NPS Program
Key partners: TDA-NPS Program, TDEC-WPC, TDOT
Year(s): 2005-2005



Long Term Goal 6.

Through the process of continuous improvement, routinely assess all programmatic functions of the TDA-NPS Program in order to maximize efficiency, decrease the bureaucratic burden and increase the numbers of participants in the program.

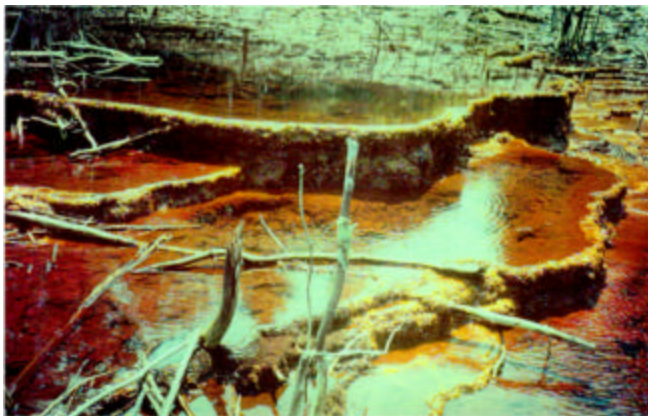
- **Action 1:** Investigate other funding sources as well as EPA.
Lead: TDA-NPS Program
Key partners: TDA-NPS Program, TDEC-EPO-WPC-WTRBA, TVA, TDOT, MTSU, USACE, USDA, TNRC&D, FHA, UTRRC, TTU, APSU, KWQF, TWRA, Consultant firms
Year(s): 2001-2005
- **Action 2:** Fund at least one demonstration project annually which will demonstrate methods to mitigate hydrologic modification polluted runoff.
Lead: TDA-NPS Program
Key Partners: TDA-NPS Program, TDEC-EPO-WPC-WTRBA, TVA, TDOT, MTSU, USACE, USDA, TNRC&D, FHA, UTRRC, TTU, APSU, KWQF, TWRA, Consultant firms
Year(s): 2000-2015 and beyond

Long Term Goal 7.

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

See Chapter 1.9 for action items related to water quality monitoring for the TDA-NPS Program.

INTRODUCTION



This chapter conveys the local, state, and federal agency, as well as the private sector commitment to protect and improve the quality of surface and ground water impaired by resource extraction activities.

DESCRIPTION

The Tennessee mining industry has been very active since the pre-Revolutionary War era. According to U.S. Bureau of Mines annual production and revenue statistics, the Tennessee mineral industry consistently ranks 15th or 16th in the nation in production revenues.

Tennessee's mineral industry is also varied according to both commodity type and mining technique. The state is the leading producer of ball clay and gemstones, in the western grand division. Tennessee is also the second leading producer of zinc, deep mined in the middle and eastern grand division.

The state also has surface and deep mine operations that extract large quantities of crushed limestone in the middle and eastern grand divisions, dredges sand and gravel across the entire state, and mines barite in the eastern grand division to a far lesser degree. Tennessee is also a producer of bituminous coal and oil and gas in the middle and eastern grand divisions. Further definition and delineation of these resource extraction activities are in Appendix D.

The environmental effects on water quality and aquatic life from these activities can be quite serious. Fortunately, many existing mining activities are regulated by National Pollutant Discharge Elimination System (NPDES) permitting programs. From the mid-1700s until the implementation of the Surface Mining Control and Reclamation Act (SMCRA) of 1977, many thousands of acres, were not reclaimed. A significant portion of these sites, especially in the Cumberland Mountains, warrant significant remediation efforts to improve in local water quality. Unreclaimed former surface mining sites are releasing highly acidic and toxic surface and ground waters to local receiving streams. Water quality and aquatic life, including endangered species, in sections of the Big South Fork of the Cumberland River have been adversely impacted as a result of acid mine drainage and sedimentation from tributary streams.

Basically, six mining/reclamation scenarios exist in Tennessee.

- mining operations which are regulated by the U.S. OSM through SMCRA, TDEC-WPC-Mining the section under NPDES, TDEC-WPC-Natural Resources section under ARAP, and US Army Corps of Engineers under Section 404. This includes ball clay, sand and gravel (Shelby County), barite, and bituminous coal.

1.5 RESOURCE EXTRACTION



- sand and gravel dredging (outside Shelby County) which is not regulated by OSM under SMCRA, but is regulated for stream access by USACE and TDEC through Section 404 and ARAP.
- mineral commodities (e.g. crushed limestone, lime, zinc, dimension stone, and sand and gravel, except in Shelby Co.) are exempted by Tennessee state law due to their importance to the agricultural and construction industries.
- Pre-SMCRA (1977) mines which can be remediated by TDEC-WPC-MS/AML under performance bond forfeiture monies, TWRA under Appalachian Clean Streams Initiative (ACSI) monies, TVA under federal allocations, NRCS under PL566 funds, and/or TDA-NPS Program under 319(h) funds.
- pre-SMCRA mines which have either naturally healed over time or have been deemed that they will do so in a fairly short order of time or those where cost effective remediation will never be possible.

EXTENT OF PROBLEM

When abandoned and un-reclaimed mining and oil and gas activities are left unchecked the environment suffers from increased sediment, toxic metal, and hydrocarbon loadings as well as very low or extremely high pH readings, high total suspended solids, and habitat loss. It is this wide range of pollutants (causes), as specified by the 303(d), List, that TDA-NPS Program and its partners are remediating and plan to continue to remediate for the foreseeable future.

Many of the streams draining un-reclaimed mined areas are impacted or impaired by runoff and subsurface flow originating at the site. Those sites being mined in a manner which abide by SMCRA and other applicable state laws generally are not impacting or impairing receiving streams or groundwater. Even so, a significant number of receiving stream miles have been impacted or impaired and have been designated on the 303(d) List generated every two years by TDEC-WPC. The following list is a compilation of these streams which will be the targets of remediative efforts through 319 funds or other state and federal funding sources.

All project proposals submitted to EPA are first compiled into a draft work plan. Summaries of each of the proposed projects are sent to a clearinghouse committee. (In accordance with Executive Order 12372–40 CFR Part 29). The Committee is comprised of several state agency representatives, including TDEC-WPC, as well as all nine (9) area development districts. Representatives of each of these agencies are given the opportunity to comment upon these proposals. The TDA-NPS Program considers comments made by these agencies and submits copies of the agency responses to EPA.

Approximately, 9.4 percent of the 352 streams found on the 1998 303(d) List or 34 streams are impaired by resource extraction issues. For further details as to what types of pollution can and are being created by Tennessee's wide range of resource extraction please see Appendix C.

1.5 RESOURCE EXTRACTION

WATERSHED NAME	RESOURCE EXTRACTION TYPE
-----------------------	---------------------------------

8-digit HUC - Cumberland River

TN0211000200918.6	Drakes Cr.	oil & gas
TN051301010091.0	Capuchin Cr.	coal
TN05130104032	White Oak Cr.	coal
TN05130104038	Brimstone Cr.	coal
TN05130104044	Straight Fork Cr.	coal
TN051301040501.9	Bear Cr.	coal
TN05130104519.3	Roaring Paunch Cr.	oil & gas
TN05130105001	Obey R.	coal
TN05130105023	Big Piney R.	coal
TN02130107023	Collins R. – Dry Cr.	coal
TN05130107	Collins R. – Big Cr. Lake	coal
TN05130108024	Collins R. – Rocky R.	coal
TN05130108027	Collins R. – Cane Cr.	coal
TN05130108	Collins R. – Spencer City L.	coal

8-digit HUC - Tennessee River

TN06010104019	Holston R. – Big Flat Cr.	limestone
TN06010104mossycr	Holston R. – Mossy Cr.	zinc
TN060101080102.0	Nolichucky R. – Davy Crocket L.	feldspar
TN060101080109.0	Nolichucky R. – Dry Cr.	sand
TN06010207001	Clinch R. Coal Cr.	coal
TN06010208005	Emory R. Flat Cr.	coal
TN06010208020	Emory R. Crab Orchard	coal
TN06020001064	Soddy Cr.	coal
TN06020001068	North Chickamauga	coal
TN06020001076	Suck Cr.	coal
TN06020002001	Hiwassee R. – Ocoee R.	copper, sulfur
TN06020002001T	Hiwassee R. – North Potato Cr.	copper, sulfur
TN06020004013	Sequatchie R. – Hills Cr.	coal
TN0603001grundy1	Sequatchie R. – Grundy L #1.	coal
TN0603001grundy2	Sequatchie R. – Grundy L #2	coal
TN06040003023	Duck R. – Sugar Cr.	phosphate
TN06040003034	Duck R. – Rutherford Cr.	phosphate
TN08010203001	Forked Deer R. – South Fork	sand & gravel

8-digit HUC - Mississippi River

TN0801010000102.3	mainstem	sand & gravel
TN08010100002	McKellar L.	sand & gravel



SOLUTIONS

Proper BMPs for use in resource extraction activities, whether for active operations or reclamation efforts, are solely dependent upon the means of extraction (e.g. surface or deep mining, dredging, or drilling). For a detailed listing of these BMPs, see 'Solutions' in Appendix D.

The TDA-NPS Program has participated in a multi – agency technical team. This team has addressed the critical issue of acid mine drainage (AMD) originating from unreclaimed, abandoned surface and deep coal mines in and near the federally managed Big South Fork (of the Cumberland) National River and Recreation Area. This team has been facilitated by the USDA-NRCS and produced a Watershed Plan/Environmental Assessment for the Restoration and Enhancement of the Bear Creek Watershed.

Existing and planned 319 projects are contributing in the remediation of these AMD problems. The TDA-NPS Program has assisted in delineating this as a watershed earmarked for the implementation of FY-99 incremental funds. This effort was designed to completely resolve AMD problems within a subwatershed once ancillary reclamation efforts promised by USDA-NRCS were completed. The TDA-NPS Program plans to continue to assist in any means possible to remediate the existing water quality problems; in the Big South Fork Cumberland River Watershed.

COOPERATING PARTNERS

<u>Partners</u>	<u>Abbreviation</u>
Kennecott Energy Company	
Sequatchie Valley Coal Company	SVCC
Kentucky Department for Environmental Protection	
Division of Water	
Nonpoint Source Program	KY-NPS
Local landowners/organizations	
Mining companies	
North Chickamauga Creek Conservancy	NCCC
Save Our Cumberland Mountains	SOCM
Sequatchie Valley Coal Co. – Kennecott Inc.	SVCC
Tennessee Citizens for Wilderness Planning	TCWP
Tennessee Department of Agriculture	TDA
Division of Administration & Grants	A&G
Ag Resources Conservation Program	ARC
RAMP efforts	RAMP
Tennessee Department of Environment and Conservation	TDEC
Division of Geology	TDG
TN Oil & Gas Board	TOGB
Division of Water Pollution Control	WPC
Aquatic Resources Alterations Permit	ARAP
Environmental Assistance Centers	EACs
Land Reclamation Section	LRS
Mining Section	MS

1.5 RESOURCE EXTRACTION



Division of Water Supply	DWS
Source Water Assessment Program	SWAP
Tennessee Resource Conservation and Development Councils	TNRC&D
Buffalo – Duck RC&D Council	B – D RC&D
Hull - York Lakeland RC&D Council	H – YL RC&D
Tennessee Valley Authority	TVA
Tennessee Wildlife Resources Agency	TWRA
US Army Corps of Engineers	USACE
USDA - Natural Resources Conservation Service	NRCS
USDI – Fish and Wildlife Service	F&WS
USDI - Office of Surface Mining	OSM
USDI - National Park Service-Big South Fork NRR	USNPS

As previously listed, many agencies, organizations, and companies have existing programs relating to resource extraction. The following text further defines these programs by means of extraction.

Active and Abandoned Surface/Subsurface Mining (Coal and Non - Coal) **Kennecott Energy Company – Sequatchie Valley Coal Company (SVCC)**

SVCC is a wholly owned subsidiary of Kennecott Energy Company and has been very active in the reclamation of hundreds of acres of coal surface mined lands in northern Sequatchie County of southeast Tennessee. Much of the treated runoff originating from portions of SVCC's recently mined and reclaimed properties runs across unreclaimed lands on its way to Dry Creek, a tributary of the Collins River located within the Cumberland River watershed. According to NPDES regulations, SVCC is not liable for the remediation of these lands, but finds it prudent to do so despite the projected costs. SVCC has committed to provide funding to a proposed 319 remaining project equal to the match amount already obligated by TDEC-WPC. SVCC would also like to treat additional sites on this property and encourages other mining companies in the region to do the same by welcoming them to view the final product of this 319 project.

Local landowners/organizations

Oftentimes, land that needs to be reclaimed is owned by a private landowner who has no mineral rights but would like to see the land reclaimed so it can be used for other purposes. This is especially the case when the land in question is in close proximity to a rapidly growing urban center. During cases like this, the landowner can be a great partner by allowing the reclamation activity to be completed and then making certain that all remediative work is kept protected to ensure local water quality improvement.

Local concerned citizens who have formed a local citizens group can also be partners by serving as a source of public awareness and actually promoting the initiation of reclamation activity. The TDA-NPS Program has and will continue to partner with such organizations to bring about the improvement of local water quality.

TDEC – Water Pollution Control – Land Reclamation Section (LRS)

This agency administers the abandoned coal mine reclamation program utilizing state and federal dollars. LRS has partnered with TDA - NPS Program in Scott County administering 319(h) funds at several abandoned coal mine sites. LRS is in the process of reclaiming AMD lands in the Chattanooga area as well as proposing remaining work in cooperation with Sequatchie Valley Coal Company. LRS strives to promote these types

1.5 RESOURCE EXTRACTION

of conservation and water quality improvement efforts throughout Tennessee's coal mining region.

LRS also performs reclamation work in non-coal areas across the state. In the FY-99 base grant, a 319 funded gravel pit remediation project, involving several local agencies, will assist in improving water quality. As part of this project, road improvements and outreach activities will be completed as demonstrations to surrounding county officials.

TDEC – Water Pollution Control – Mining Section (MS)

This agency regulates the active mining industry, where applicable, through the NPDES program. The agency also administers the non-coal regulatory program, and Tennessee coal mining law of 1972 and its 1980 amendment (bond collection programs). Surface disturbances associated with underground mining and tailings associated with an NPDES permitted discharge are also regulated.

Tennessee Valley Authority (TVA)

The TVA maintains land reclamation provisions in coal purchase contracts and monitors TVA's coal suppliers for compliance with state and federal reclamation laws. Between 1976-80 TVA sponsored an "orphan" or abandoned coal mine land reclamation program with Tennessee that reclaimed 6,032 acres in 13 counties. Over the years, TVA has been involved in abandoned non-coal mine land reclamation programs in the Copper Basin in Polk County; manganese mines in Johnson and Carter counties; and, phosphate mines in Maury and Hickman counties. The Cooperative Copper Basin project has been very successful in reclaiming and reforesting many thousands of acres of land denuded by crude copper smelting practices that occurred between the 1850s and 1930s, throughout the basin drained by the Ocoee River.

Tennessee Wildlife Resources Agency (TWRA)

This agency has been reclaiming AMD sites in Tennessee's coal mining region for the past nine years. A ten-year program funded in part by the state and the EPA/OSM Appalachian Clean Streams Initiative (ACSI) was utilized. TWRA often contracts with LRS to do the actual reclamation work at their Obed River watershed sites.

US Army Corps of Engineers (USACE), 404 Permit

The USACE permits, through the Section 404 regulatory process, active mining when activities (e.g. stream crossings, bridge construction, sediment basins, or channelization projects) involve the discharge of dredged or fill material below the ordinary high water mark of the stream. Prior review of plans and inspection of the site by USACE are required before any work can be initiated. Failure to do so or disobedience of the USACE requirements places the operator in violation of the law and subject to work stoppage as well as a fine.

The USACE is supporting wetland creation or restoration, stream channel restoration, stream bank stabilization, development of watershed management plans, riparian corridor restoration, and detention and treatment of storm water runoff, all of which are treatments used in AML/AMD reclamation efforts, through the Section 206 Ecosystem Restoration Program. This program allows the USACE to assist state and local governments and many nonprofit entities in the planning, design, and construction of projects for aquatic ecosystem restoration and protection. Eligible projects include in AML/AMD reclamation.

1.5 RESOURCE EXTRACTION



USDA – Natural Resource Conservation Service (NRCS)

This agency administers ACSI funding from OSM and the Rural Abandoned Mines Program (RAMP), a reclamation program once funded by OSM. NRCS has completed the 'Watershed Plan/Environmental Assessment for the Restoration and Enhancement of the Bear Creek Watershed' through multi-agency partnering efforts and is procuring additional funds for this through PL566. Their efforts would compliment an EPA FY-99 Incremental 319 grant targeting the West Branch of the Bear Creek.

US Fish & Wildlife Services (F&WS)

The F&WS is the principal federal agency responsible for conserving, protecting, and enhancing fish, wildlife, and plants and their habitats for the continuing benefit of the American people. These goals are accomplished through Federal programs relating to migratory birds, threatened and endangered species, certain marine mammals, inland sport fisheries, specific fishery and wildlife research activities, and management of the National Wildlife Refuge System and National Fish Hatchery System.

Programs implemented by the Tennessee/Kentucky Field Office are concentrated in the areas of endangered species recovery, habitat restoration on public and private lands, contaminant assessments, rare species surveys and monitoring, wetland and other habitat characterizations, and evaluations of the effects of proposed water and land development projects, including surface and underground mining, on fish and wildlife resources and habitats.

Contaminant assessments include the collection of fish and wildlife tissue, egg, and blood samples, as well as water and sediment samples, for analysis of reproductive hormones, organic and inorganic contaminants, and physicochemical parameters. Fish and wildlife health assessments are also routinely performed. These activities are short term in duration and are generally not performed more than once in one annual cycle. The resulting data is utilized to determine the diversity of resources present and to assess potential exposure and effects from contaminants and other ecological stressors. Typically, reports are prepared and distributed to interested and participating federal, state, and local entities.

USDI – Office of Surface Mining (OSM)

This agency regulates and oversees state regulation of the coal mining industry Pursuant to Public Law 95 - 87. Because Tennessee returned primacy of surface mining regulation, an OSM field office staffed with approximately 60 professionals is located in Knoxville. All coal surface mines are regulated by this office. This agency also regulates the surface disturbance associated with underground mining. OSM provided AML fund to the state of Tennessee through the AML discretionary fund. Therefore, the state of Tennessee does not receive a fixed amount each year. Rather, the amount may vary from year to year based on the state's requests and other OSM requests for funding from the Discretionary Fund.

1.5 RESOURCE EXTRACTION**Dredge Mining****US Army Corps of Engineers (USACE)**

The USACE issues permits under the authority of Section 10 of the Rivers and Harbors Act of 1899, for dredging that occurs within navigable waters of the US. In non-navigable waters, the extraction of dredged material does not require USACE approval if the material is completely removed from the waterway. If the dredged material is discharged in the stream bed or if dredged materials are relocated from one area to another within the stream bed, these activities would then require USACE approval pursuant to Section 404 of the Clean Water Act.

Section 206 Ecosystem Restoration Program Section 206 of the Water Resources Development Act (WRDA) of 1996 allows the Corps to assist state and local governments and many nonprofit entities in the planning, design, and construction of projects for aquatic ecosystem restoration and protection. Eligible projects include wetland creation or restoration, stream channel restoration, stream bank stabilization, development of watershed management plans, riparian corridor restoration, and detention and treatment of storm water runoff. The Corps pays 65% of project costs, not to exceed \$5 million. The sponsor must provide 35% of project costs and operate and maintain the completed project. This program is not limited to Corps of Engineers lands or properties.

Section 1135 of the WRDA of 1986 authorizes the Corps of Engineers to improve environmental quality by focusing on wetland restoration and fish and wildlife habitat improvements. The thrust of this program is focused on environmental restoration opportunities on Corps of Engineers lands and projects. The Corps will pay 75% of planning, design, and construction costs. Section 1135 projects are limited to 7.5\$ million, with the federal share capped at \$5 million.

TDEC – Water Pollution Control – Natural Resources Section (NRS)

All eight TDEC-WPC EACs issue permits and periodically inspect all other operations regardless of size of waterway. Any alterations involving stream habitat must be first approved by this agency through its administration of the state Aquatic Resources Alteration Program (ARAP).

Petroleum Activities (drilling, storage, and transport)**TDEC – Division of Geology – TN Oil & Gas Board (TOGB)**

This agency permits and regularly inspects active oil and gas operations and maintains an inventory of abandoned wells. The State Oil and Gas Board established abandoned well reclamation funds in TC4-60-1–404. It also is in charge of the Orphan Well program, which remediate abandoned wells contaminating surface waters or subsurface aquifers.

Tennessee Wildlife Resources Agency (TWRA)

This agency has statutory authority to levy fines if a fish kill occurs as a result of contamination (i.e. brine disposal in streams).



Other Funding Sources

TDEC-Division of Community Assistance (DCA)

The State Revolving Fund (SRF) is managed by TDEC-DCA. This agency has expressed the desire to expand its funding to NPS projects. Several meetings have been held between the SRF Program, WPC, and TDA-NPS to discuss directing SRF funding towards nps issues. As this point in time, no reclamation projects have been funded by the SRF. For more information pertaining to the acquisition of such funds, interested parties would need to contact the TDEC-DCA office in Nashville (615/532-3568).

TDEC-Water Pollution Control-Land Reclamation Section (LRS)

The LRS has the authority to utilize mining forfeiture bond funds collected through the state NPDES program. This funding has been applied to both AMD and non-AMD reclamation for the past ten (10) years. For more information pertaining to the acquisition of such funding, interested parties would need to contact the LRS office in Knoxville (865/594-6035).

US Army Corps of Engineers (USACE)

A recent addition to the USACE is the Section 206 Ecosystem Restoration Program. This program allows the USACE to assist state and local governments and many nonprofit entities in the planning, design, and construction of projects for aquatic ecosystem restoration and protection. Eligible projects include wetland creation or restoration, stream channel restoration, stream bank stabilization, development of watershed management plans, riparian corridor restoration, and detention and treatment of storm water runoff, all of which are treatments used in AML/AMD reclamation.

Another USACE program is the Section 1135 that authorizes it to improve environmental quality by focusing on wetland restoration and fish and wildlife habitat improvements. These are also needed in AML/AMD restoration efforts.

USDI-Office of Surface Mining (OSM)

The OSM has the ability of obtaining limited amounts of funding from the Appalachian Clean Streams Initiative. Presently, the Tennessee Wildlife Resource Agency has been able to capture some of this funding for stream habitat and reclamation work in AMD impacted streams. For information pertaining to the acquisition of such funding interested parties would need to contact the U.S. Office of Surface Mining located in Knoxville (865/545-4103).

Additional funding sources for environmental projects are listed in the Catalog of Federal Funding, which can be found at: www.aspe.os.dhhs.gov/cfda

CURRENT 319 PROJECTS

Resource extraction reclamation projects have been funded since the program's inception. With only one exception, each of these projects has addressed acid mine drainage originating from abandoned, un-reclaimed, pre-law coal mines on the Cumberland Plateau. Since the first 319 project was partnered with LRS, only one project has ever been partnered with any other entity.

1.5 RESOURCE EXTRACTION

Through many years of experience, LRS has acquired valuable knowledge of the proper means of addressing AMD issues. The staff also cooperates with the Knoxville Environmental Assistance Center (EAC). The Knoxville EAC employees a staff biologist who is a recognized expert in the field of AMD treatment. TDEC also manages the state's performance forfeiture bond that enables mining remediation efforts across the entire state.

Realizing that AMD is not the only resource extraction issue, a project has been submitted to address gravel (chert). More of these projects will be initiated to improve local water quality as well as provide the impetus for local entities to perform such projects.

Although oil and gas production has never been very significant in the state, there are many abandoned wells/boreholes left unplugged across middle and east Tennessee. These wells cause water table fluctuations and subsurface contamination due to the conveyance potential of the open borehole. Efforts are currently in the planning stage to address abandoned wells impacting 303(d) listed streams.

The following is a list of current and proposed 319 projects for Resource Extraction.

Grant Yr.	Project Title	Location
FY-90	AMD Remediation in Bear Cr. of BSF	Scott Co./NE. TN
FY-92	AMD Remediation in Bear Cr. of BSF	Scott Co./NE. TN
FY-93	AMD Remediation in Bear Cr. of BSF	Scott Co./NE. TN
FY-96	AMD Remediation in N. Chickamauga Cr.	Hamilton Co./SE TN
FY-99	Morgan Cr. Chert Pit/AML Proj.	Hickman Co./M. TN
FY-99	prop. O&G borehole & site remediation/grant pool	Undetermined/M. TN
FY-99	NPS water quality assessment by TDEC	Statewide
FY-99 (UWA)	West Br. of Bear Cr./AMD Remediation Proj	Scott Co./NE. TN
FY-99 (UWA)	Pre-BMP monitoring by TDH-Lab Services	Scott Co./NE. TN
FY-2000 Dry Cr	Watershed Restoration/Remining Proj	Sequatchie Co./E TN

AREAS FOR PROGRAM EXPANSION

The Resource Extraction Working Group recommends the following program areas for expansion.

Surface and Subsurface Mining
Active Surface Mining (Non-Coal)

TDEC regulates active non-coal mines by issuing NPDES permits and mining permits for mining of non-exempt minerals. Exemption of additional minerals from regulations by the mining act may further exacerbate NPS pollution and should be seriously reconsidered. The lead agency is TDEC-WPC.

1.5 RESOURCE EXTRACTION**Abandoned Surface and Subsurface Mining (Coal)**

LRS estimates that 20 million dollars will be necessary to address the critical acreage of abandoned coal surface mines in the Abandoned Mine Land Inventory which contribute to environmental degradation. Currently, the state funded program (one million dollars per year for ten years (ten million dollars)) is leaving a critical funding shortage of ten million dollars. The lead agency in the state for abandoned coal mine reclamation is LRS which performs much reclamation on AML/AMD sites throughout the coalfields. This type of effort needs to be accelerated with the assistance of other entities at the local, state, and federal levels. Coordinating agencies include: NRCS, OSM, TVA, and TWRA.

AMD from the abandoned underground coal mines is probably one of the worst sources of ground water contamination in the coal mining region. The fracturing of sandstone caps as a result of past blasting subsidence, and a network of tunnels and pillars in acid bearing shales make for a complex intermingling of aquifers; it results in ground water contamination which often manifests itself miles from the source.

Abandoned Surface and Subsurface Mining (Non-Coal)

There are currently no significant non-coal reclamation programs in Tennessee. The TVA and its cooperators have a cooperative re-vegetation program at Copper Basin in Polk County. There is a critical need for an updated non-coal AML inventory with cost projections, and funding of a non-coal reclamation program on-the-ground. The lead agency in the state for non-coal programs is LRS. Coordinating agencies include NRCS and TVA.

There are thousands of acres of abandoned non-coal surface mines. TVA and cooperators, including small private landowners, completed reclamation on 276 acres of abandoned manganese mines in Johnson and Carter counties in northeast Tennessee and 146 acres of abandoned phosphate mines in Maury and Hickman counties of middle Tennessee.

Siltation, acidity, and heavy metal pollution resulting from erosion of denuded lands in southeast Tennessee's Copper Basin is listed as one of the high priority water resources problems in a TVA report entitled, "Water Resources Management in the Tennessee Valley." This land was completely denuded by more than a century of copper mining and associated smelting activities. TVA had an early historical involvement in re-vegetating the Copper Basin during the 1930s and 40s. In the early 1980s, it joined with Tennessee Chemical Company (TCC), the predecessor of the current owner, Boliden Intertrade (BIT), to extend reclamation activities. This area is currently being investigated for potential inclusion into Tennessee's Superfund Program or may be listed on the Federal National Priority List. (Comprehensive Environmental Research, Compensation and Liberty Act.)

Since 1984, TVA and its cooperators have reclaimed 10,517 acres with re-vegetative treatments and installed two major surface water sediment control structures. They also have prepared a master treatment plan for re-vegetation of the remaining 2,095 acres of partially vegetated lands. The remaining problem area in need of treatment is about seven percent of the original 32,000 acres. A potential 319 project is possible since TVA was recently privatized. (This could present itself as a potential 319 project when TVA

1.5 RESOURCE EXTRACTION



match status favorably changed because TVA stopped receiving congressional appropriations.)

There may be a need for the development of informative outreach materials that would address the AML/AMD issues as well as the opportunity for local entities to become more involved in this effort. The state of Alabama currently has a conglomerate of SCDs that address minor AML/AMD issues too small for the state and federal agencies to address.

There also needs to be an increased effort in locating additional funding sources such as The Nature Conservancy, the Brownfields program, as well as EPA and others.

Petroleum Activities

Resources are needed to plug abandoned oil and gas wells and reclaiming storage tank sites. These abandoned wells and sites create significant impacts to local ground water resources. The lead agency is the TDEC–DG-TOGB. Coordinating agencies include EPA, TWRA, TDEC-DWS, and TDEC-WPC.

TDA-NPS Program

The TDA-NPS Program will seek new partners in the quest for funding more resource extraction activities. The first opportunity to be investigated will be existing partners such as the NRCS, TVA, US Coast Guard, USF&WS, US-OSM/ACSI, USBM, TDEC-SRF Program, TWRA, SCDs, RC&D councils, development districts, county governments, and local environmental and citizen organizations. This action will require the Resource Extraction working group to become broader in membership and more active to the point of initiating a productive forum for the exchange of ideas and the growth of partnering efforts.

The second opportunity to be investigated will be grants located within agencies and organizations that are presently not partners (i.e. TDEC-DCA/State Revolving Fund). This action will require TDA-NPS Program to investigate other agencies and organizations in a manner that will reveal all of the available funds as well as how they can be used.

Additional funding sources for environmental projects are listed in the Catalog of Federal Funding, which can be found at: www.aspe.os.dhhs.gov/cfda

WATER QUALITY MONITORING & ASSESSMENT

The 319 funding has been designed to assist TDEC-WPC statewide monitoring efforts. This development will enable TDEC-WPC to dedicate more staff time to intensively monitor surface water in point source impacted areas of Tennessee. These funds will also be used to analyze suspended solids, pH, acidity, and heavy metal concentrations in AMD areas.

The TDEC-WPC Watershed Management approach is based upon a five-year cycle in which every 8-digit HUC watershed is monitored. Through this effort, TDEC-WPC should be able to provide a much clearer picture as to where AMD and sediment

1.5 RESOURCE EXTRACTION



problems are originating, thereby affording the 319 Program with a better working knowledge as to where to implement BMPs.

The success of TDEC-WPC's efforts should become evident in the near future as monitoring efforts in the Emory River. While combining existing data with recently collected data, this effort should reveal much needed information from the coal mining region of East Tennessee.

Additional data will also be available as students located in resource extraction affected watersheds begin to be involved with TDA's Instream Education (ISE) program. This program provides teachers and students with the instruction they need to initiate monitoring programs. Although it is unlikely that these efforts would ever be considered by TDEC-WPC as data acceptable for 303(d) assignments, it could serve as an indicator where additional BMP implementation work needs to be done. TDA-NPS will be in the position to distribute its instructional ISE material as early as 2000.

ENFORCEMENT MECHANISMS

All proposed mining sites are first reviewed by TDEC-WPC for NPDES permit issues as well as by USACE for 404 and wetland issues. The submitting mine operator is instructed as to what BMPs to install as well as how to install them. Sites visits are made by TDEC-WPC in advance to assure that the most effective BMPs are proposed in the best possible locations. During mining operations, these BMP sites are inspected on a regular basis to ensure that water quality is being adequately protected.

Every operator is required to post a mining performance forfeiture bond which is returned to them after successfully completing the project in accordance with the clean water BMP parameters set forth prior to mining. If the operator should fail to completely reclaim the site, then TDEC-WPC is required by law to withhold the bond. The operator has an opportunity to rectify the situation if significant water pollution has not already occurred. If this is not done, then the bond is kept by the state and is used to fund qualifying reclamation efforts across the state.

The state managed ARAP program requires any plans for affecting a stream be reviewed by TDEC-WPC. If the intentions are not within set standards mining plans or mine reclamation plans must be modified to remain in accordance with the ARAP standards. Those operations that do not are subject to a severe fine.

Currently, a state and federal reclamation program, funded at a level of approximately \$1,500,000 per year, addresses abandoned coal mines. There are more than 46,000 acres of abandoned surface coal mines, as well as hundreds of abandoned underground mines, throughout the coal producing Cumberland Plateau. Of this acreage, more than 11,000 acres have been assessed by LRS as needing immediate attention.

MEASURES OF SUCCESS

An annual review of the success of Resource Extraction reclamation projects will be initiated to assure that 319 and matching funds are being expended in the most effective manner. The existing Resource Extraction working group, comprised of local, state, and

1.5 RESOURCE EXTRACTION

federal entities, will need to closely examine water quality data collected in impacted streams to determine if the scope of the projects need to be revised.

During these annual meetings, strengths and weaknesses of the statewide effort should be determined and, through interaction of these entities, partnering efforts should be modified to better contend with the remaining Resource Extraction issues. The removal of 303(d) listed streams because of BMP implementation causing them to support their designated uses and the level of agency, local organization, and citizen involvement in BMP implementation and water quality assessment should be the leading measures of success.

MILESTONES**Long Term Goal 1.**

Hold regularly scheduled meetings with stakeholders, to create new partnerships, to strengthen existing partnerships, and to foster greater trust, commitment and accountability.

- **Action 1:** The Resource Extraction Working Group (REWG) will meet semi-annually.
 Lead: TDA-NPS Program
 Key partners: Mining companies; Local landowners; Local SCDs; TDEC-TOGB; TDEC-WPC-LRS; TDEC-WPC-MS; TDOT; TN RC&D; TWRA; TVA; USACE; USDI-F&WS; USDI-OSM; USDA-NRCS; UT-CTAS
 Year(s): 2001 – 2005
- **Action 2:** Increase REWG membership by one member each year.
 Lead: TDA-NPS Program
 Key partners: Mining companies; Local landowners; Local SCDs; TDEC-TOGB; TDEC-WPC-LRS; TDEC-WPC-MS; TDOT; TN RC&D; TWRA; TVA; USACE; USDI-F&WS; USDI-OSM; USDA-NRCS; UT-CTAS
 Year(s): 2001 – 2005
- **Action 3:** Establish the REWG mission statement, a list of collective capabilities, and priorities for funding.
 Lead Agencies: REWG and TDA-NPS Program
 Key partners: Mining companies; Local landowners; Local SCDs; TDEC-TOGB; TDEC-WPC-LRS; TDEC-WPC-MS; TDOT; TN RC&D; TWRA; TVA; USACE; USDI-F&WS; USDI-OSM; USDA-NRCS; UT-CTAS
 Year(s): 2001-2005
- **Action 4:** Work with other agencies to develop a prioritization list of non-coal projects for reclamation.
 Lead Agencies: REWG and TDA-NPS Program
 Key partners: Mining companies; Local landowners; Local SCDs; TDEC-TOGB; TDEC-WPC-LRS; TDEC-WPC-MS; TDOT; TN RC&D; TWRA; TVA; USACE; USDI-F&WS; USDI-OSM; USDA-NRCS; UT-CTAS
 Year(s): 2001-2005

1.5 RESOURCE EXTRACTION



- **Action 5:** Create a non-coal reclamation program.
 Lead: REWG & TDA-NPS Program
 Key partners: County government; Mining companies; Local landowner; Local SCDs; TDEC-DCA/SRF; TDEC-TOGB; TDEC-WPC-LRS; TDEC-WPC-MS; TDEC&CD; TDOT; TN RC&D; TWRA; TVA; USACE; USDI-F&WS; USDI-OSM; USDA-NRCS; UT-CTAS; Watershed assoc.
 Year(s): 2001-2005
- **Action 6:** Develop Memoranda of Agreement with key federal agencies to improve programmatic consistency.
 Lead: TDA-NPS Program
 Key Partners: All federal agency partners
 Year(s): 2001-2005

Long Term Goal 2.

Fully implement all developed TMDLs for nonpoint sources in compliance with existing regulations, policies, or agreements by 2015.

- **Action 1:** Coordinate water quality remediation efforts between TDEC-WPC and TDA-NPS Program with the development of resource extraction-related TMDLs, researching a unified approach in setting TMDL standards.
 Lead: TDEC-WPC & TDA-NPS Program
 Key partners: TDEC-WPC-LRS; USDI-F&WS; USDI-OSM
 Year(s): 2001
- **Action 2:** Continue interagency coordination of TMDL development and initiate remediation efforts based on TMDL direction.
 Lead:
 Key Partners: TDEC-WPC-LRS; USDI-F&WS; USDI-OSM
 Year(s): 2015,
- **Action 3:** Continue interagency coordination of TMDL development and initiate remediation efforts based on TMDL direction.
 Lead:
 Key Partners: TDEC-WPC-LRS; USDI-F&WS; USDI-OSM
 Year(s): 2010
- **Action 4:** Continue interagency coordination of TMDL development and initiate remediation efforts based on TMDL direction.
- **Action:** Practice close TMDL coordination with TDEC-WPC.
 Lead: TDEC-WPC & TDA-NPS Program
 Key partners: TDEC-WPC-LRS; USDI-F&WS; USDI-OSM
 Year(s): 2005

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

1.5 RESOURCE EXTRACTION



- **Action 1:** 20% of the streams impaired due to resource extraction on the 1998 303(d) List will support their designated uses.
 Lead Agencies: TDEC-WPC and TDA-NPS Program
 Key partners: Local SCDs; TDEC-WPC-LRS; TWRA; TVA; USDI-OSM
 Year(s): 2005
- **Action 2:** 40% of the streams impaired due to resource extraction on the 1998 303(d) List will support their designated uses.
 Lead Agencies: TDEC-WPC and TDA-NPS Program
 Key partners: Local SCDs; TDEC-WPC-LRS; TWRA; TVA; USDI-OSM
 Year(s): 2010
- **Action 3:** 60% of the waters listed on the 1998 303(d) List due to resource extraction will support their designated uses.
 Lead: TDEC-WPC-LRS
 Key Partners: Local SCDs; TWRA; TVA; USDI-OSM
 Year(s): 2015
- **Action 4:** Cooperate with TDEC-Oil & Gas Board to plug abandoned wells and reclaim their locations for those found in 1998 303(d) Listed streams.
 Lead Agencies: TDEC-O&GB & TDA-NPS Program
 Key partners: TDEC-DWS-GWM
 Year(s): 2001-2005
- **Action 5:** Cooperate with TDEC-Oil & Gas Board to plug abandoned wells and reclaim their locations for those found in 303(d) listed streams.
 Lead: TDEC-O&GB & TDA-NPS Program
 Key partners: TDEC-DWS-GWM
 Year(s): 2001-2005

Long Term Goal 4.

Beginning in 2006, through regulatory and non-regulatory means, prevent previously unlisted waters from being included on the 303(d) List because of nonpoint source impairments.

- **Action 1:** Implement BMPs on streams not listed on the 303(d) List
 Lead: REWG & TDA-NPS Program
 Key partners: County government; Mining companies; Local landowner; Local SCDs; TDEC-DCA/SRF; TDEC-TOGB; TDEC-WPC-LRS; TDEC-WPC-MS; TDEC&CD; TDOT; TN RC&D; TWRA; TVA; USACE; USDI-F&WS; USDI-OSM; USDA-NRCS; UT-CTAS; Watershed assoc.
 Year(s): 2001-2005
- **Action 2:** No waters will not support their designated uses because of resource extraction.
 Lead: TDEC-WPC-LRS and TDA-NPS Program
 Key partners: Local SCDs; TWRA; TVA; USDI-OSM
 Year(s): 2015



Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution, and how to prevent it.

- **Action 1:** Correspond with other coal producing states to learn innovative techniques and approaches to addressing resource extraction problems.
Lead: REWG & TDA-NPS Program
Key partners: County government; Mining companies; Local landowner; Local SCDs; TDEC-TOGB; TDEC-WPC-LRS; TDEC-WPC-MS; TN RC&D; TVA; USACE; USDI-OSM; USDA-NRCS
Year(s): 2001-2005
- **Action 2:** Demonstration projects will be initiated to address AML re-mining, and gravel pit, barite, ball clay, and phosphate mine reclamation.
Lead: TDA-NPS Program
Key partners: TDEC-WPC-LRS; TDEC-DCA; TDEC&CD; TACD; TN RC&D ; TWRA; USDA-NRCS; USDI-OSM
Year(s): 2001-2005
- **Action 3:** Develop/distribute resource extraction educational material to the general public, and especially to persons in areas affected by extraction.
Lead: TDA-NPS Program
Key partners: TDEC-WPC-LRS; TWRA; USDA-NRCS; USDI-OSM; UTIA; USDI-FWS
Year(s): 2001-2005
- **Action 4:** Through 319 demonstration projects across the state, encourage local entities to create funding partnerships to remediate abandoned mine sites which are affecting local water quality.
Lead: TDA-NPS Program
Key partners: TDEC-WPC-LRS; TDEC-DCA; TDEC-EPO; TDEC&CD; TWRA; TNRC&Ds; SCDs; TACD; Co. highway dept.; Develop. Districts; TVA; USDI-F&WS; UT-CTAS; Dana Fund
Year(s): 2001-2005

Long Term Goal 6.

Through the process of continuous improvement, routinely assess all programmatic functions of the TDA-NPS Program in order to maximize efficiency, decrease the bureaucratic burden and increase the numbers of participants in the program.

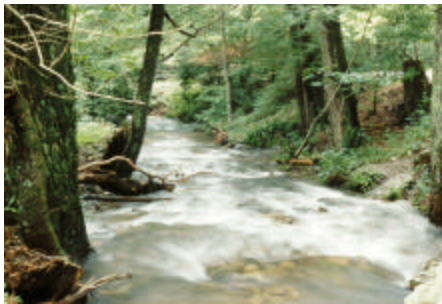
- **Action 1:** Investigate other funding sources such as The Nature Conservancy, Brownfields Program, as well as EPA.
Lead: TDA-NPS Program
Key partners: TDEC-WPC-LRS; The Nature Conservancy; US EPA
Year(s): 2001-2005

Long Term Goal 7.

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

See Chapter 1.9 for action items related to water quality monitoring for the TDA-NPS Program.

INTRODUCTION



Forests cover 13.3 million acres of Tennessee, which provide wood, clean water, wildlife habitat, outdoor recreation and beauty to our state. Private, non-industrial landowners control 80 percent of Tennessee's forestland. Wood products manufacturing is one of Tennessee's largest industries. Considering both direct and indirect economic impacts, it adds about 17.1 billion dollars to the state's economy each year and employs about 163,000 Tennesseans. Wood delivered to

the mills is one of Tennessee's most valuable crops. The Tennessee Nonpoint Source Program, NPS, has developed a Forestry Working Group with many agencies working as cooperative partners. Long Term goals and action items related to silvicultural activities are listed on page 1-6-8.

EXTENT OF PROBLEM

Forestry-generated nps pollution represents a minor part of the total nps load in the State. The potential for forestry nps pollution is greatest from activities related to timber harvesting and reforestation. Timber haul roads, skid trails, log landings, and mechanically site-prepared areas are sites where the potential for soil movement is greatest.

The combined area subject to timber harvesting is estimated to be approximately 250,000 acres annually. The total area of mechanical site preparation, an activity where potential for considerable soil movement exists, continues to decline in favor of less costly and less persistent herbicides used for control of competing vegetation in softwood reforestation and release.

Logging and other silvicultural operations still affect only a small fraction (less than 3 percent) of the total commercial forest acreage of the State annually. The average size of these operations is relatively small (@50 acres) and widely dispersed across the landscape. Typical operations are temporary, lasting only a few days or weeks, and intervals between entries into the same areas are widely spaced, normally 20 to 50 years. While some forestry water quality problem events occur, no watersheds or streams can be singled out as having chronic or lasting water quality problems traceable to forestry activities. Overall, forestry activities in Tennessee affect water quality to a minor degree. The 1998 303(d) List reports four waterbodies as impacted by silviculture. Among these waterbodies approximately 57.5 miles are listed as partially supporting and 1.7 miles as not supporting.

1998 303(d) list with Silviculture as a pollutant source

Lower Duck River Basin

Waterbody ID	Impacted Waterbody
TN06040003041	LICK CREEK From N. Fork Locke Br to Walker Hill Rd is partial. Tribs are not supporting.

South Fork of the Cumberland River Basin

TN05130104026	CLEAR FORK RIVER – Crooked Cr from mile 14.6 to 33.0 is partially.
TN05130104038	BRIMSTONE CREEK – Above Mill Cr is partial.

Emory River Basin

TN06010208005	GREASY CREEK
---------------	--------------

SOLUTIONS

Best Management Practices

A BMP Manual: Guide to Forestry Best Management Practices, was produced in 1993. This document contains the BMPs that are recommended by TDA, Forestry Division to lessen the environmental impact of forest management activities. BMPs developed for forestry activities in the mid-1980s have, by all indications, been effective for their purpose. The BMP Manual is currently in the process of being revised.

Research to Test BMP Effectiveness

A joint research project between the of Forestry Division, Tennessee Wildlife Resources Agency, and the Center for Management, Utilization, and Protection of Water Resources at Tennessee Technological University (TTU) was conducted on an undisturbed watershed on Pickett State Forest during the period 1987 to 1990. The research objective was to determine the effectiveness of forestry BMPs applied when tree stands were clear-cut and naturally regenerated.

TTU researchers found virtually no detectable changes in water quality of streams in the area and concluded that BMPs, when correctly applied, can prevent water pollution from sediment generated on access roads, skid trails, and log landings and from herbicides applied in harvested stands. The research project concluded that the forestry BMPs tested are generally adequate, if properly used.

Documenting Use of Best Management Practices

In 1992, the Forestry Division conducted an initial investigation of 150 logging operations throughout the state to determine the extent of BMP use as a relative measure of the effectiveness of BMP education and training efforts. Results showed although many loggers were familiar with BMPs, many were not using them. Even so, sediment delivery to streams was found to be a problem in relatively few operations.

It was concluded that the Division's Water Quality Program (<http://www.state.tn.us/agriculture/forestry/tdfbp.html>) had been reasonably successful in creating awareness in the forestry community about water quality as an issue and the



need to apply BMPs. Increased forestry activities would require the addition of a technical assistance component to demonstrate use of BMPs to individual landowners, loggers, and other operators.

Best Management Practices implementation rate is the barometer used to judge the effectiveness of TDA-Forestry's NPS management program. BMP implementation surveys have been conducted in 1993 and 1996. Implementation rates for these surveys were 50% and 63% respectively. A new survey is being planned for 2000. The program's targeted BMP implementation goal is 75% by 2005 and 80% by 2010. These surveys prove invaluable for assessing progress toward targeted rates. Future surveys will also be formatted to evaluate differences in BMP implementation between relevant sample groupings (i.e.: master logger vs. non-master logger, industry lands vs. private lands, etc.).

In 1995, a new BMP implementation survey procedure was developed to more objectively document the application of BMPs on logging, site preparation, and prescribed burning operations. In 1996, 200 operations were surveyed using the new procedure. The overall rate of implementation (use) was 62.9 percent.

In 1999, the University of Tennessee completed a field evaluation of BMP use on 191 harvesting operations on nonindustrial private forestlands. The evaluation tried to document BMP implementation by Master Loggers (<http://www.state.tn.us/agriculture/forestry/tdfml.html>). Twenty percent of the harvesting jobs were conducted by Master Logger graduates. Master logger's scored on average 75 percent, as opposed to an average score of 60 percent for loggers who had not yet attended the education program.

COOPERATING PARTNERS

Partners

Tennessee Association of Conservation Districts
Tennessee Department of Agriculture
 Ag Resource Conservation Fund
Tennessee Department of Agriculture
 Forestry Division
Tennessee Department of Environment and Conservation
 Division of Water Pollution Control
Tennessee Forestry Association
Tennessee Resource Conservation and Development
 Councils
Tennessee Wildlife Resources Agency
University of Tennessee, Knoxville
 UT Institution of Agricultural Services
US Cherokee National Forest
US Forest Service

Abbreviation

TACD
TDA-ARC

TDA-Division of
Forestry
TDEC-WPC

TFA
TN RC&D

TWRA

UTIA
USCNF
USFS

Tennessee Association of Conservation Districts (TACD)

TDA-ARC funds have been made available for cost share to each soil conservation district to fund tree plantings.



Tennessee Department of Agriculture–Ag Resource Conservation Fund (TDA-ARC)

This fund helps fund two initiatives by the TDA-Forestry Division: 1) Tennessee Reforestation Incentive Program, TRIP. TRIP is an incentive program for landowners for tree planing in barren unproductive lands and 2) Agriculture Resource Conservation Program which funds the installation of BMPs in forest areas, planting riparian buffer zones and planting bottom land hardwood trees.

Tennessee Department of Agriculture, Forestry Division

The Forestry Division's water quality program goal is to **prevent water pollution caused by forestry and other activities in forested areas**. Objectives to achieve the program goal include:

- Educate the forestry community regarding the use of BMPs.
- Provide technical assistance concerning BMP application.
- Monitor BMP use.
- Assist other agencies in resolving water quality problems

Encouraging BMP use, educating the forestry community, evaluating BMP use, and investigating water quality complaints continue to be the biggest challenges facing the Forestry Division's water quality program.

Tennessee Department of Environment and Conservation – Division of Water Pollution Control (TDEC-WPC)

The Division of Water Pollution Control is responsible for the administration of the Tennessee Water Quality Control Act of 1977 (T.C.A. 69-3-101). Based on this authority, TDEC-WPC is the primary partner with the Forestry Division in investigating and resolving water quality complaints associated with silvicultural operations.

Tennessee Forestry Association (TFA)

The TFA is a major partner in the Master Logger Program. The mission of the TFA is to promote the understanding of and appreciation for forests and related resources of Tennessee and their development for the benefit of all citizens of the state. Toward that end they:

- Educate the public about the wisdom of sustainable forest management.
- Advocate forest practices that conserve forest, soil, water, aesthetic, and wildlife resources.
- Promote the use of forest products for the economic well being of the state.
- Support legislation in the interest of scientific forest management.
- Provide landowners with information about the benefits and responsibilities of forest stewardship, and
- Advocate about the right of private landowners to responsibly manage their land.

Tennessee Master logger Program (<http://www.tenfor.org/logger.html>)

The Tennessee Master Logger Program is designed to improve the health and management of forest resources while improving logger safety practices and business management skills. The Master Logger Program is open to all loggers



harvesting timber in Tennessee and surrounding states. Foresters and timberland owners may also attend. The Program consists of a five-day training course. One day of training is given once every two weeks for ten weeks.

The course has five sections: Logger Safety, Forest Ecology/Best Management Practices, Forest and Wildlife Management, First Aid and Business Management

Tennessee Resource Conservation and Development Councils (TN RC&D)

The RC&D Councils help educate the public about forestry BMPs.

Tennessee Wildlife Resources Agency (TWRA)

TWRA is a partner in the Forest Stewardship Program. It also manages several wildlife management areas across the state.

University of Tennessee, Knoxville – U.T. Institute of Agriculture (UTIA)

UTAES are partners in the Master Logger program and are actively involved in BMPs education.

U.S. Forest Service (USFS)

The U.S. Forest Service gives TDA-Forestry Division grant funds for landowner assistance such as the Forest Stewardship Program that involves land management for multiple uses. Protection of water quality and use of BMPs are key elements of these landowner assistance activities.

Cherokee National Forest (CNF)

Standards and guidelines (BMPs) to protect water quality are used during all management activities on the Cherokee National Forest. Forestry-related standards and guidelines closely mirror the best management practices developed by the State of Tennessee. A Memorandum of Understanding addressing nonpoint source pollution and BMP design and use between the State of Tennessee and the USDA, Forest Service, Cherokee National Forest was entered into in 1997. TDA, Division of Forestry works closely with USNF and makes comments on their forest plans.

Land Between the Lakes

Administration of Land Between the Lakes has recently been transferred from TVA to the U.S. Forestry Service. This change will allow similar partnerships as entered with the Cherokee National Forest.

OTHER FUNDING SOURCES

Additional funding sources for environmental projects are listed in the Catalog of Federal Funding, which can be found at: www.aspe.os.dhhs.gov/cfda

CURRENT 319 PROJECTS

Tennessee Department of Agriculture, Forestry Division

Tennessee's current 319 NPS Forestry Plan, developed in 1988, incorporated many of the strategies prescribed in the State's previously developed 208 Forestry Plan. Major objectives included (1), gaining widespread support from within the forestry community for implementing the water quality program, and (2), informing and training natural



resource professionals, forest managers and operators, and landowners regarding the potentials for water pollution caused by forestry activities and use of BMPs. An additional objective for the next 5 years will be to educate loggers, landowners, and foresters to the procedures involved with investigating water quality complaints and potential penalties if water quality problems are not resolved.

These objectives were strongly supported and substantially accomplished. To demonstrate support for the Program, government agencies, wood-using industries, conservation organizations, and private consultants made themselves and their employees available for training, adopted BMPs for use on their own lands, furnished technical assistance to forest operators and landowners, and assisted the Division in other ways to help make the Program a success.

The task of informing and training members of the forestry community was formidable. Several publications were developed including BMP handbooks, a brochure about the Water Quality Program, and a BMP videotape. In addition, a Forest Water Quality Newsletter is published quarterly.

From May 1988 through February 1995, the Division conducted 190 group training conferences concerning protection of water quality and use of BMPs for more than 4,000 resource managers, woods workers, and landowners at numerous locations throughout the State. Presentation of this session was only possible with the strong support of the wood-using industries and other natural resource agencies.

In 1992, the Tennessee Master Logger Program (MLP) was created to provide loggers with continuing education opportunities in logger safety, first aid, forest management techniques, BMPs, and how to manage a successful business. As part of this Program, loggers are provided intensive training in how to implement BMPs, along with the opportunity to evaluate BMPs on actual logging operations. Since the inception of the Master Logger Program, more than 1,195 loggers have completed the five-day course. (See the following section for Tennessee Master Logger Program <http://www.state.tn.us/agriculture/forestry/tdfml.html>)

In 1995, the Division's **Logger Contact Program** was established to (1) *develop and improve working relationships with loggers*, and (2) *provide loggers technical assistance in the application of BMPs*. By the end of 1998, over 1,284 logging contractors had been contacted by Division foresters. Of this total, 500 were new, first-time contacts. These site visits represented over 125,000 acres affected by logging operations.

During the winter of 1998, 241 forest technicians and aides completed a three-day training course, enabling them to provide assistance to Division foresters in contacting loggers and providing BMP technical assistance.

History of 319(h) Funding

FY	Grant Amount	Recipient	Purpose
FY92	\$30,000	TDA Forestry	BMP Training/Education
FY93	\$30,000	TDA Forestry	BMP Training/Education
FY94	\$30,000	TDA Forestry	BMP Training/Education
FY95	\$30,000	TDA Forestry	BMP Training/Education
FY96	\$80,000	TDA Forestry	BMP Training/Education



FY97	\$80,000	TDA Forestry	BMP Training/Education
FY98	\$80,000	TDA Forestry	BMP Training/Education
FY99	\$80,000	TDA Forestry	BMP Training/Education

AREAS FOR PROGRAM EXPANSION

- Additional BMP education and technical assistance, including increased participation in Tennessee's Master Logger Program, is needed for greater BMP use among forest landowners and loggers.
- Establish additional BMP demonstration sites on State Forests.
- Increase progress toward the goal of 80 percent BMP implementation on forestlands.
- Increase work group activity to provide a forum to discuss progress.

ENFORCEMENT MECHANISMS

Section 69-3-120 (g), Tennessee Code Annotated, exempts agricultural and forestry activities from regulation "unless there is a point-source discharge from a discernible, discrete, water conveyance." Accordingly, Tennessee's 319 Silvicultural NPS Program is operated as a non-regulatory program. This approach is consistent with most of the other state forestry NPS programs in the Southeast.

Complaints

One measure of public awareness and concern about nps pollution caused by forestry activities is the number of complaints received by the Forestry Division, Department of Environment and Conservation, and Tennessee Wildlife Resources Agency. A Memorandum of Agreement was formalized between the TDEC-WPC and the TDA-Forestry Division in April 1987. In this agreement, the TDA-Forestry Division agreed to investigate complaints alleging nps pollution damage from failure to use BMPs in forestry operations and report to WPC regarding the findings of the TDA-Forestry Division investigator. Since 1994, the TDA-Forestry Division investigated 254 complaints arising from silvicultural operations.

In July 1995 a new Memorandum of Understanding (MOU) was signed between the TDEC-WPC and the TDA that superseded and updated the former agreement. This new MOU better defined the relationship between TDEC-WPC and TDA-Forestry Division relative to addressing pollution from silvicultural activities. In addition, written procedures were developed for TDA-Forestry Division personnel in conducting formal investigations of complaints. Emphasis is placed on correcting improper practices and furnishing information and assistance on proper BMP application; however, provisions exist to refer instances involving operators' refusal to comply with the Division of Water Pollution Control for possible enforcement actions.

In 1997, Senate Joint Resolution No. 230 established the Forest Management Advisory Panel (see <http://www.state.tn.us/agriculture/forestry/tfc/rec1.htm> for more details). The Resolution identified 35 separate organizations. Beginning in November of 1997, the Panel held 11 monthly two-day meetings. The Panel was charged with evaluating and recommending, "appropriate policy and programs that promotes forest sustainability and sound stewardship of all Tennessee forest lands." The panel articulated 11 goal areas



that are essential if Tennessee's forests are to be used and managed in a sustainable manner. The Panel endorsed 28 majority recommendations and 24 minority recommendations. Panel recommendations addressed all aspects of forestry, including water quality. Water quality specific recommendations included continued support of Best Management Practices compliance through voluntary practices and to strengthen and enforce consequences or disincentives for loggers who violate water quality laws.

In January 1999, an additional memorandum of agreement was signed between the TDEC-WPC and the TDA-Forestry Division (<http://www.state.tn.us/environment/epo/badactor.htm>). This policy was developed in part as a response to recommendations from the Forest Management Advisory Panel on "bad actors" in forestry operations. Through their research and discussions, the panel had identified a need to penalize forestry operators who blatantly or habitually violate water quality laws.

The purpose of this policy is to use the authority of the Water Quality Control Act of 1977 to address "bad actors" in forestry operations; to encourage Best Management Practices (BMPs) and to assure the protection of public health, the environment and the waters of the state. The violator will be required to attend and successfully complete the Master Logger training program or equivalent educational program in order to continue operations in Tennessee.

MEASURES OF SUCCESS

- Increase the number of loggers trained each year.
- Number of BMPs recommended increases annually.
- Increased BMP implementation rate.

MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, to strengthen existing partnerships, and to foster greater trust, commitment and accountability.

- **Action 1:** The Forestry Working Group (FWG) will meet semi-annually.
Lead: TDA-Forestry Division
Key partners: TFA; TWRA; TACD; TDEC-WPC; TNRC&D; UTIA; USFS; USDA-NRCS; TDA-NPS Program
Year(s): 2001 – 2005
- **Action 2:** Increase FWG membership by one member each year.
Lead: TDA-NPS Program
Key partners: TFA; TWRA; TACD; TDEC-WPC; TNRC&D; UTIA; USFS; USDA-NRCS; TDA-NPS Program
Year(s): 2001 – 2005



- **Action 3:** Establish the FWG mission statement, a list of collective capabilities, and priorities for funding.
Lead Agencies: FWG and TDA-Forestry Division
Key partners: TFA; TWRA; TACD; TDEC-WPC; TNRC&D; UTIA; USFS; USDA-NRCS; TDA-NPS Program
Year(s): 2001-2005
- **Action 4:** Develop Memoranda of Agreement with key federal agencies to improve programmatic consistency.
Lead: TDA-NPS Program
Key Partners: All federal agency partners
Year(s): 2001-2005

Long Term Goal 2.

Fully implement all developed TMDLs for nonpoint sources in compliance with existing regulations, policies, or agreements by 2015.

Refer to Chapter 1.11, TMDL Implementation for specific action items related to this Long Term Goal.

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- **Action 1:** 20% of the streams impaired due to silviculture on the 1998 303(d) List will support their designated uses.
Lead Agencies: TDA-Forestry Division and TDA-NPS Program
Key partners: TFA; TWRA; TACD; TDEC-WPC; TNRC&D; UTIA; USFS; USDA-NRCS
Year(s): 2005
- **Action 2:** 60% of the streams impaired due to silviculture on the 1998 303(d) List will support their designated uses.
Lead Agencies: TDA-Forestry Division and TDA-NPS Program
Key partners: TFA; TWRA; TACD; TDEC-WPC; TNRC&D; UTIA; USFS; USDA-NRCS
Year(s): 2010

Long Term Goal 4.

Beginning in 2006, through regulatory and non-regulatory means, prevent previously unlisted waters from being included on the 303(d) List because of nonpoint source impairments.

- **Action 1:** Attain the BMP use-rate goal of 75 percent in forestry operations.
Lead: TDA-Division of Forestry
Year(s): 2005
- **Action 2:** Attain the BMP use-rate goal of 80 percent in forestry operations.
Lead: TDA- Division of Forestry
Year(s): 2010



- **Action 3:** Evaluate annually, if necessary, the Memorandum of Agreement between the TDEC and TDA regarding investigation of complaints about forestry operations.
Lead: TDEC-WPC and TDA-Division of Forestry
Key partners: TDA-NPS Program; TFA
Year(s): 2001 - 2005

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution, and how to prevent it.

- **Action 1:** Conduct on-site visits with loggers and other forest operators and furnish technical assistance concerning application of BMPs.
Lead: TDA-Forestry Division; TFA; UTIA
Key partners: TDA-NPS Program; FWG
Year(s): 2001-2005
- **Action 2:** Conduct forestry water quality and BMP familiarization and training conferences for resource managers, forest operators, and landowners.
Lead: TDA-Forestry Division; TFA; UTIA
Key partners: TDA-NPS Program; FWG
Year(s): 2001-2005
- **Action 3:** Conduct 60 forest water quality and BMP training components of the Master Logger Program.
Lead: TDA-Forestry Division; TFA; UTIA
Key partners: TDA-NPS Program; FWG
Year(s): 2001-2005
- **Action 4:** Conduct 50 continuing education training courses for master loggers.
Lead: TDA-Forestry Division; TFA; UTIA
Key partners: TDA-NPS Program; FWG
Year(s): 2001-2005
- **Action 5:** Conduct riparian forest protection, restoration, and management course for TDA-Forestry Division foresters.
Lead: TDA-Forestry Division; TFA; UTIA
Key partners: TDA-NPS Program; FWG
Year(s): 2001-2005
- **Action 6:** Update and publish a BMP Manual for forestry activities.
Lead: TDA-Forestry Division; TFA; UTIA
Key partners: TDA-NPS Program; FWG
Year(s): 2001-2005



- **Action 7:** Publish four issues annually of Water Quality Newsletter.
Lead: TDA-Forestry Division; TFA; UTIA
Key partners: TDA-NPS Program; FWG
Year(s): 2001-2005
- **Action 8:** Continue to educate loggers, landowners, and foresters to the procedures involved with investigating water quality complaints and potential penalties if water quality problems are not resolved.
Lead: TDA-Forestry Division and TFA
Key partners: TDA-NPS Program
Year(s): 2001-2005
- **Action 9:** Create one new Forestry related educational project biennially
Lead: TDA-Forestry Division and FWG
Key partners: TDA-NPS Program
Year(s): 2005
- **Action 10:** Establish a riparian zone education initiative to forest landowners.
Lead: TDA-NPS Program
Key partners: FWG
Year(s): By 2005
- **Action 11:** Develop at least six Forestry BMP demonstration projects on state forestland.
Lead: TDA-Forestry Division and FWG
Key partners: TDA-NPS Program
Year(s): By 2005

Long Term Goal 6.

Through the process of continuous improvement, routinely assess all programmatic functions of the TDA-NPS Program in order to maximize efficiency, decrease the bureaucratic burden and increase the numbers of participants in the program.

- **Action 1:** Investigate other funding sources such as The Nature Conservancy, Brownfields Program, as well as EPA.
Lead: TDA-NPS Program
Key partners: The Nature Conservancy; US EPA
Year(s): 2001-2005
- **Action 2:** Request feedback from partners annually to assess the quality of the services provided by the TDA-NPS Program.
Lead: TDA-NPS Program
Year(s): 2001-2005

Long Term Goal 7.

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

See Chapter 1.9 for action items related to water quality monitoring for the TDA-NPS Program.

INTRODUCTION



The purpose of this chapter is to summarize local, state, and federal agency and organizational commitment to protect and improve the quality of surface and ground water through the management of land disposal activities across Tennessee. This will include identifying non-regulated problems, prioritizing problems, increasing partnership participation, and developing interest in creating demonstration projects. This chapter is subdivided for clarity, so that the

issues involved with failing septic systems can be discussed separately from the issues involving landfills and other solid waste application to the land.

- Municipal/Industrial waste applications
 - Soil chemistry analysis
 - Proper storage of waste
 - Proper spreading of waste
 - Assessment of water quality to ensure protection
 - Public awareness & education
- Public awareness & education
 - Creation & distribution of educational materials for all land disposal types
 - Brochures & pamphlets
 - Videos
 - CD-ROMs
 - Internet sites
- Failing pre-law landfills
 - Determination of location
 - GIS tracking
 - Prioritization according to water quality
 - Determination of appropriate entity for cleanup
 - Site cleanup
- Illegal dumpsites
 - Support of citizens and local officials
 - Determination of location
 - GIS tracking
 - Prioritization according to water quality
 - Site cleanup
 - Public awareness & education
- Abandoned/mismanaged salvage yards
 - Determination of location
 - GIS tracking
 - Determination of appropriate entity for cleanup
 - Site cleanup



Failing Septic Systems

DESCRIPTION

Failing septic systems are found randomly scattered throughout the state often involving a small area, a remote location, or just a few landowners. Often, the actual source of the problem is difficult to determine without an expensive and time-consuming reconnaissance study. And, in many cases, simply determining which state agency has jurisdiction over the pollution problem might be difficult. In such cases, this problem needs to be addressed and followed up with appropriate remediation efforts and monitoring.

EXTENT OF PROBLEM

Pollutants from failing septic tank systems enter streams and degrade water quality. Failing septic systems impact 11 out of the 352 streams listed on the 1998 303 (d) List. The following list is a compilation of these streams, which will be the targets of remediative efforts through 319 funds or other state or federal funding sources. The following list is a portion of the 1998 303(d) List which includes only the streams affected by failing septic systems. See Appendix C for the complete 1998 303(d) List.

WATERSHED NAME	IMPACT
8-digit HUC - Cumberland River	
South Fork-Pine Cr.	Septic systems
8-digit HUC - Tennessee River	
Upper French Broad R.-Big Cr.	Septic systems
Little Pigeon R.	Septic systems
Little Pigeon R.-W. Prong	Septic systems
Little Pigeon R.-W. Prong-Walden Cr.	Septic systems
Little Pigeon R.-W. Prong-Dudley Cr.	Septic systems
Little R.-Crooked Cr.	Septic systems
Lower Clinch R.-Coal Cr.	Septic systems
Hiwassee R.-Cane Cr.	Septic systems
Guntersville Res.-Big Fiery Gizzard Cr.	Septic systems
Big Sandy R.-W. Sandy Cr.	Septic systems

SOLUTIONS

The following is a listing of Best Management Practices(BMPs) that can be used to solve failing septic tank problems:

- Investigation of complaint files at county health departments
- Infrared imagery to determine problem areas
- On the ground surveys to verify problem areas
- Low Pressure Pipe systems (LPPs)
- Septic Tank Effluent Pump (STEP) systems
- STEP systems with recirculating sand filters for treatment
- Artificial wetlands



- Mound systems
- Adoption of Building ordinances
- Education of contractors and the public

Currently, the TDA-NPS Program is:

- entering into contract with the City of Maryville to build a Septic Tank Effluent Pump (STEP) system just outside of the city limits to remediate septic system failures in a twenty-five unit housing development. Many county officials from the surrounding region will observe this project, and
- planning a 319 project to demonstrate the benefits of artificial wetlands when combined with conventional septic systems servicing homes and schools. Many county officials from the surrounding region will observe these BMPs.

COOPERATING PARTNERS

Partners

County Executive offices
County Health Departments
Development Districts
Local watershed associations and citizens groups
Public Lands
Tennessee Department of Environment and Conservation
 Division of Community Assistance
 Division of Ground Water Protection
 Division of Water Pollution Control
Tennessee Home Builders Association
Tennessee Resource Conservation and Development Districts
UT County Technical Assistance Service
UT Institute of Agriculture
UT-Municipal Technical Advisory Service

Abbreviations

TDEC
-DCA
-GWP
-WPC
THBA
TNRC&D
UT-CTAS
UTIA
UT-MTAS

The following text defines the programs that deal with septic/sewage system issues.

County Executive Offices

County and municipal governments, across the entire state, will be introduced to such systems or modified systems using wetlands, sand filters, and mounds in the next several years through local 319 demonstration projects. It is hoped that the local governments will employ such systems to abate existing problems and in future developments in an effort to reduce and eliminate water pollution.

County Health Departments

Local county health departments are responsible for tracking septic system failures and are also held accountable by the public for resolving the problems. More innovative methods of disposing of human waste are needed. STEPs, LPPs, mounds, and artificial wetlands are methods that may be used. By forming partnerships with TDEC-GWP, TDA-NPS Program, and local groups, these types of projects can be initiated to remediate the existing problems and to prevent new problems from occurring.



Development Districts

Nine (9) development districts exist across Tennessee to promote and assist in the growth of the areas they control. These districts have a vested interest in promoting clean water because future residents are more likely to move to their area if they know clean, usable water is readily available.

As growth continues in an area, the most suitable land for housing is acquired, leaving only marginal lands for further growth. This can cause stagnation in the growth of the area unless knowledgeable district partners from water quality agencies find means in which to establish needed housing sites. A good example of this is the use of the STEP system in areas where TDEC-GWP has designated the land as being marginal for single home septic system use. In addition, older existing facilities exhibiting septic system failure, such as schools, churches, and places of business, can be renovated through the use of STEPs, thereby revitalizing these facilities. This in turn can make the local community more attractive to development while assuring the existence of cleaner water.

Local watershed associations and citizens groups

These groups may help protect water quality from the impacts of failing septic systems by being the first to notice problems and notifying the proper authorities.

Public Lands

These agencies and their lands, listed below, may own facilities which are serviced by septic systems. The agencies are aware of the proper installation and maintenance of such systems and are willing to remediate any water quality related problems that might develop. By doing so, these agencies comply with the intentions of the TDA-NPS Program.

US Dept. of Defense-Army

Holston Ordnance Works
Volunteer Ordnance Works
Milan Arsenal

US Dept. of Defense-Air Force

Arnold Engineering Development Center
Ft. Campbell Military Reservation
Millington Airbase

US Dept. of Interior-Park Service

Cumberland Gap Historical Park
Great Smoky Mts. National Park
Big South Fork National River and Recreational Area
Chickamauga National Military Park
Stones River National Battlefield
Ft. Donelson National Military Park
Meriwether Lewis National Monument
Shiloh National Military Park

Natchez Trace National Parkway
US Dept. Agriculture-Forest Service

Cherokee National Forest
Land Between the Lakes National Forest
US Dept. of Energy



Oak Ridge National Laboratories

TDEC- Division of Community Assistance State Revolving Fund (SRF)

The SRF allows the states to issue low interest loans to municipal governments across Tennessee. The loans have primarily been used to fund the building or improvement of municipal wastewater treatment and collection systems. Recently, SRF funding guidance has encouraged the use of the SRF to address nonpoint source projects.

TDEC-Division of Ground Water Protection (TDEC-GWP)

Since the late 1980's, TDEC-Division of Ground Water Protection (TDEC-GWP) has been actively ensuring that all new residential and business units meet the septic system requirements established by state law. This has been a significant effort to help prevent pollution in receiving surface and subsurface water resources.

Yet, many septic systems were constructed prior to the law. There are about 7,000 permits per year to correct failing systems due to a variety of reasons. TDEC-GWP performs septic system failure surveys of communities upon request in order to provide these communities with the data they must have in order to acquire funding for new systems or a multi-unit system.

Through partnerships with EPA, TDA-NPS Program, TVA, local county governments, and others, TDEC-GWP will be able to discern which housing developments are causing pollution problems, through the use of the 1998 303(d) List and infrared imaging. (TVA has done considerable amounts of infra-red work in the Valley.) After determining where the problems are, they should be corrected as soon as possible. Currently, TDEC-GWP is working in close partnership with the Chickasaw-Shiloh RC&D Council, local county governments, citizens, and TDA-NPS Program to establish a 319 project in southwest Tennessee, involving innovative treatment technologies.

TDEC-Division of Water Pollution Control (TDEC-WPC)

WPC monitors the water quality of all Tennessee's waters through the five-year rotating watershed approach. This program identifies waters impaired by pollutants, including those from failing septic tanks.

Tennessee Homebuilder's Association (THBA)

The THBA is an association of home building companies with chapters in Middle, East and West Tennessee. In recent years, they have teamed up with the City of Chattanooga to host certification workshops. The THBA will continue to work together with city and county organizations to ensure that local codes require all new homes be built with properly designed and installed septic systems.

Tennessee Resource Conservation and Development Districts (TNRC&D)

The RC&Ds promote environmentally sound development in their areas and have worked with the TDA-NPS Program on several water quality projects. The issue of waste water disposal is one of many topics that may be addressed by the RC&Ds with the help of partner agencies.

UT County Technical Assistance Service (CTAS)

The CTAS was created by the Tennessee General Assembly in 1973 at the urging of county officials. It is an agency of the University of Tennessee Institute for Public



Services. CTAS has been the primary technical assistance service group for the state's 95 counties whose mission is to promote better government by assisting county officials in developing and implementing ideas and methods for improving service to county citizens. CTAS will be a strong partner in coordinating the statewide efforts concerning the problem of failing septic tank systems.

UT Institute of Agriculture (UTIA)

The UTIA has for many years recognized the fact that human waste, in addition to animal waste, significantly contributes to the pollution of both surface and subsurface water resources across the state. UTIA has participated in well water monitoring at one location in Bedford County, in an effort to determine the origin of high fecal and nutrient loadings to local surface streams and subsurface aquifers. In addition, UTIA installed a demonstration Low Pipe Pressure system in Bedford County and monitored to test its effectiveness. They created a video and fact sheet with information about this project. Local UTIA staff provides public awareness information to the community. UTIA provides assistance in proper maintenance of septic systems as well as other human activities on the farm and homestead, thereby reducing the impact on the quality of local water resources.

UT Municipal Technical Advisory Service (UT-MTAS)

MTAS was created in 1949 by the state legislature to enhance the quality of government in Tennessee municipalities. An agency of the University of Tennessee Institute for Public Services, MTAS works in cooperation with the Tennessee Municipal League to assist municipal officials with issues such as sewage collection and treatment. MTAS will be instrumental in the education of municipal officials concerning solutions to the problem of failing septic tank systems.

OTHER FUNDING SOURCES

The State Revolving Fund (SRF) is managed by TDEC's Division of Community Assistance (DCA). This agency has expressed the desire to expand its funding to lower cost projects found within the nonpoint source water pollution arena. Several meetings have been held between DCA, WPC and the TDA-NPS Program to learn more of what can be done to direct SRF funding towards nonpoint source issues.

The Tennessee Department of Economic and Community Development administers the Community Development Block Grant Program in Tennessee. This program provides grant funding to municipal governments to fund wastewater infrastructure projects. One of the central criteria for a project being eligible for funding is the documented failure rate of septic systems in the proposed project area. Contacts can be made with this department to coordinate projects so common goals can be achieved.

Additional funding sources for environmental projects are listed in the Catalog of Federal Funding, which can be found at: www.aspe.os.dhhs.gov/cfda

CURRENT 319 PROJECTS

FY-96	Constructed Wetlands Project	McNairy County
FY-99	Septic Tank Effluent Pump System	City of Maryville



AREAS FOR PROGRAM EXPANSION

Failing Septic Systems

The total number of failing septic systems across Tennessee should be known. This can be accomplished through surveys conducted county by county, as well as with aerial imaging technologies. With this information the TDA-NPS Program along with the LDWG can more precisely plan remediation and demonstration projects.

Promotion of State Revolving Funds in BMP implementation

As the SRF Program is looking for projects beyond the normal scope of building large waste treatment plants it would be advantageous for this program to assist individuals or organizations who had developed interest in implementing a wide array of land disposal BMPs. Perhaps county governments and/or development districts could intervene in behalf of the landowners, under certain circumstances, to help solve their problem.

WATER QUALITY MONITORING & ASSESSMENT

TDEC-Division of Water Pollution Control

Currently, 319 funds are being awarded to TDEC-WPC to increase the density and aerial extent of nonpoint source area coverage in their water quality monitoring scheme. As land disposal related sites are found and delineated as having water quality impairment possibilities the TDEC-WPC monitoring effort should focus on these sites to determine their effects on water quality. If it is proven that these sites do cause impairment BMP implementation should occur and follow-up monitoring should proceed to determine if this effort was sufficient in negating the original impact of the land disposal site. These efforts should be coordinated between TDEC-WPC and the implementing agency. TDEC-WPC is responsible for addressing water quality problems via State of Tennessee Rule 1200-4-3.

TDEC-Division of Water Supply

The Ground Water Management Section of TDEC's Division of Water Supply (TDEC-DWS) has been charged with the responsibility of managing the Source Water Assessment Program (SWAP). Through these efforts, a contract has been made with the Tennessee Association of Utility Districts (TAUD) to complete reconnaissance surveys of every public and private water intake site in the state. Information gathered during these surveys consists of any point and/or nonpoint sources of water pollution. This information is recorded for GIS storage and presentation and can be used by local and state entities in projects related to illegal dumpsites, abandoned landfills, failing septic systems, abandoned salvage yards, and incidences of improperly spread municipal and/or animal waste.

ENFORCEMENT MECHANISMS

Tennessee Department of Environment and Conservation is comprised of several divisions, four of which are assigned the task of regulating many land disposal activities. The following text highlights the enforcement responsibilities of these divisions.



TDEC-Division of Ground Water Protection

TDEC-GWP is given the responsibility for regulating subsurface sewage disposal systems through the State of Tennessee Rule 1200-1-6 and TCA 68-221-401-414. Since the 1980's, TDEC-GWP has been actively ensuring that all new residential and business units meet the septic system rules promulgated in response to state law. Stringent rules are enforced, through rigorous pre-construction inspections, to ensure that newly constructed units are equipped with septic systems which are established in percolating soils with enough volume to effectively treat the effluent produced by the associated dwelling or business.

TDEC-Division of Water Supply

Currently there are no programmatic mandates which allow TDEC-DWS to regulate any non-regulatory pollution causing activities found within the SWAP assessed areas. Any remediative efforts will need to be funded and performed through local partnerships. TDEC-DWS is responsible for enforcing drinking water regulations through the State of Tennessee Rule 1200-5-1.

TDEC-Division of Water Pollution Control

TDEC-WPC is also responsible for responding to public water quality complaints which could arise from failing septic/sewage system activities and attempt to independently find these problems during the course of their assessment efforts. Once violations to the state's water quality law have been discovered by TDEC-WPC, enforcement procedures against the operator or landowner are enacted to remedy the problem. TDEC-WPC is responsible for enforcing water quality regulations through State of Tennessee Rule 1200-4-3 and the Tennessee Water Quality Control Act.

Division of Solid and Hazardous Waste Management

Information regarding solid waste processing and disposal (including landfills) is available from the Division of Solid/Hazardous Waste Management. Hazardous waste generation, recycling, storage, transportation, treatment and disposal within Tennessee is also regulated by this Division.

MEASURES OF SUCCESS

- increase in the number of failing septic system assessments
- increase in the publication of educational materials related to groundwater issues
- decrease in the streams listed on the 303(d) List because of septic/sewage system issues.
- special session held each year at the Partnership Conference concerning groundwater pollution issues.

MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, to strengthen existing partnerships, and to foster greater trust, commitment and accountability.

- **Action 1:** The Land Disposal Working Group (LDWG) will meet semi-annually.
Lead: TDA-NPS Program
Key partners: TDEC-SWM; TDEC-DCA; TDA-RS; UTIA; TDOT; KTB; KAB; TNRC&D
Year(s): 2001 – 2005
- **Action 2:** Increase LDWG membership by one member each year.
Lead: TDA-NPS Program
Key partners: TDEC-SWM; TDEC-DCA; TDA-RS; UTIA; TDOT; KTB; KAB; TNRC&D
Year(s): 2001 – 2005
- **Action 3:** Establish the LDWG mission statement, a list of collective capabilities, and priorities for funding.
Lead Agencies: LDWG and TDA-NPS Program
Key partners: TDEC-SWM; TDEC-DCA; TDA-RS; UTIA; TDOT; KTB; KAB; TNRC&D
Year(s): 2001-2005
- **Action 4:** Develop Memoranda of Agreement with key federal agencies to improve programmatic consistency.
Lead: TDA-NPS Program
Key Partners: All federal agency partners
Year(s): 2001-2005

Long Term Goal 2.

Fully implement all developed TMDLs for nonpoint sources in compliance with existing regulations, policies, or agreements by 2015.

- **Action 1:** Coordinate water quality remediation efforts between TDEC-WPC and TDA-NPS Program with the development of Land Disposal-related TMDLs, researching a unified approach in setting TMDL standards.
Lead: TDEC-WPC & TDA-NPS Program
Key partners:
Year(s): 2001
- **Action 2:** Provide information concerning TMDL development to the LDWG, to gain their participation.
Leads: TDA-NPS Program, TDEC-WPC
Key Partners: LDWG
Year(s): 2001-2005



- **Action 3:** Provide necessary input to TDEC-WPC concerning nonpoint issues on 100% of waters selected for TMDL development.
Leads: TDA-NPS Program, TDEC-WPC
Key Partners: LDWG
Year(s): 2001-2005
- **Action 4:** Create an implementation plan for any TMDL developed by TDEC-WPC involving pollutants originating from Land Disposal nonpoint sources.
Leads: TDA-NPS Program, TDEC-WPC
Key Partners: LDWG
Year(s): 2001-2005

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- **Action 1:** Install BMPs so that 20% of the streams impaired due to failing septic systems on the 1998 303(d) List will support their designated uses.
Lead: TDEC-WPC
Key partners: TDEC-SWM; TDEC-DCA; TDA-RS; UTIA; TDOT; KTB; KAB; TNRC&D
Year(s): 2005
- **Action 2:** Install BMPs so that 60% of the streams impaired due to failing septic systems on the 1998 303(d) List will support their designated uses.
Lead: TDEC-WPC
Key partners: TDEC-SWM; TDEC-DCA; TDA-RS; UTIA; TDOT; KTB; KAB; TNRC&D
Year(s): 2010

Long Term Goal 4.

Beginning in 2006, through regulatory and non-regulatory means, prevent previously unlisted waters from being included on the 303(d) List because of nonpoint source impairments.

- **Action 1:** Implement BMPs on streams not listed on the 1998 303(d) List
Lead: LDWG & TDA-NPS Program
Key partners: TDEC-SWM; TDEC-DCA; TDA-RS; UTIA; TDOT; KTB; KAB; TN
Year(s): 2001-2005
- **Action 2:** Provide funding to projects that will keep waters from being 303(d) Listed due to failing septic systems.
Lead: TDA-NPS Program
Key partners: TDEC-SWM; TDEC-DCA; TDA-RS; UTIA; TDOT; KTB; KAB; TNRC&D
Year(s): 2005

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution, and how to prevent it.



- **Action 1:** Develop and distribute educational material concerning failing septic system issues in increasing amounts each year.
Lead: TDA-NPS Program
Key partners: LDWG
Year(s): 2001-2005
- **Action 2:** Through 319 demonstration projects across the state, encourage local entities to create projects to remediate improper failing septic systems sites which are affecting local water quality.
Lead: TDA-NPS Program
Key partners: LDWG
Year(s): 2001-2005
- **Action 3:** Provide educational information concerning failing septic systems on the TDA-NPS web page.
Lead: TDA-NPS
Year(s): 2001

Long Term Goal 6.

Through the process of continuous improvement, routinely assess all programmatic functions of the TDA-NPS Program in order to maximize efficiency, decrease the bureaucratic burden and increase the numbers of participants in the program.

- **Action 1:** Investigate other funding sources such as The Nature Conservancy, Brownfields Program, as well as EPA.
Lead: TDA-NPS Program
Key partners: The Nature Conservancy; US EPA
Year(s): 2001-2005
- **Action 2:** Provide responses to all project related inquiries from grantees within three business days of the request.
Lead: TDA-NPS Program
Year(s): 2001-2005
- **Action 3:** Work with grantees to achieve timely submittal of all progress reports 100% of the time.
Lead: TDA-NPS Program
Year(s): 2001-2005
- **Action 4:** Request feedback from partners annually to assess the quality of the TDA-NPS Program
Lead: TDA-NPS Program
Year(s): 2001-2005

Long Term Goal 7.

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

See Chapter 1.9 for action items related to water quality monitoring for the TDA-NPS Program



Landfills, Pesticide Management and Solid Waste Land Application

EXTENT OF PROBLEM

Six (6) out of the 352 waterbodies listed on the 1998 303(d) List generated every two years by TDEC-WPC, have been impacted or impaired by landfills. Fourteen (14) have been contaminated with pesticides. The following list is a compilation of these streams, which will be the targets of remediative efforts through 319 funds or other state or federal funding sources. Below is a portion of the 1998 303(d) List which includes the streams affected by landfills and pesticides:

WATERSHED NAME	IMPAIRMENT
8-digit HUC – Duck River	
Old Hickory L.-Spring Cr.	Landfill
So. Harpeth R.	Landfill
Red R.-Poorhouse Br.	Landfill
Upper Duck R.-Thompson Cr.	Landfill
Lower Duck R.-Sugar Cr.	Landfill
Upper Kentucky Res.-Beech Cr..	Landfill
Sugar Creek	Pesticides
8-digit HUC – Lower Cumberland Basin	
Seven Springs Cr.	Pesticides
8-digit HUC – Mississippi River	
Miss. R.-Loosahatchie R.	Pesticides
McKellar Lake	Pesticides
Miss. R.-Loosahatchie R., Hatchie R.	Pesticides
Miss. R.-Loosahatchie R., Obion R.	Pesticides
Miss. R.-Obion R. to KY state line	Pesticides
Miss. R. Bessie Bend area	Pesticides
Wolf River Harbor	Pesticides
Loosahatchie R.-Big Cr.	Pesticides
Loosahatchie R.-Big Cr., Cypress & Oliver	Pesticides
Wolf River-Fletcher Cr., Harrington Cr.	Pesticides
Wolf River-Fletcher Cr. to Hwy. 177	Pesticides
Lower Nonconnah Cr.-Cold Cr.	Pesticides

SOLUTIONS

The solutions to the impairments listed on the 1998 303(d) List referenced above involve the coordination of TDEC-SWM and TDEC-DCA and TDA-Reg. Services. Additionally, a determination needs to be made on each waterbody, about the exact source of the impairment. If the landfill causing the impairment is a permitted landfill, then the solution to this impairment will be to enforce the provisions of the permit.

Concerning pesticide contamination, many of the waterbodies listed are segments of the mainstem of the Mississippi River. Pollutant sources could be from sources other than those located in Tennessee.



Many streams have localized impairments to water quality from illegal dumpsites located near by the stream. Projects have been funded by TDA-NPS Program to address this problem as a means of preventing streams from becoming listed.

The land application of Solid Waste including Municipal Bio-solids has not been shown to cause any impairment to waters of Tennessee. These activities are regulated by TDEC-SWM and WPC respectively. The pollution of water resources is highly unlikely due to the strict guidelines in place.

COOPERATING PARTNERS

Partners

Agrichemical manufacturers
 Appalachian RC&D Council
 Austin Peay State University
 Brownfields Program
 Clinch - Powell RC&D Council
 Development Districts
 Keep America Beautiful chapters
 Keep Blount Beautiful
 Keep Tennessee Beautiful Program/Univ. of Memphis
 Local watershed associations and citizens groups
 Public Lands
 Soil Conservation Districts
 Tennessee Agricultural Production Association
 Tennessee Department of Agriculture
 Ag. Resources Conservation Fund
 Regulatory Services
 Tennessee Department of Environment and Conservation
 Division of Community Assistance
 Division of Solid Waste Management
 Division of Water Supply
 Division of Water Pollution Control
 Tennessee Department of Transportation
 Tennessee Farmers Cooperative
 Tennessee Golf Course Superintendent's Association
 Tennessee Nurserymen's Association
 Tennessee Resource Conservation and Development Councils
 Buffalo - Duck River RC&D Council
 Chickasaw - Shiloh RC&D Council
 Five Rivers RC&D Council
 Hull - York Lakeland RC&D Council
 Smoky Mt. RC&D Council
 Southeast TN RC&D Council
 Pesticide Management Program
 Tennessee Technological University
 Tennessee Valley Authority
 USDA-Natural Resources Conservation Service

Abbreviations

Appal. RC&D
 APSU

 C - P

 KAB
 KBB
 KTB

 SCDs
 TAPA

 ARCF
 RS
 TDEC
 DCA
 SWM
 DWS
 WPC
 TDOT
 TFC
 TGCSA
 TNA
 TNRC&D
 B - DR
 C - S
 Five Rivers
 H - YL
 SMRC&D
 SETN
 PMP
 TTU
 TVA
 NRCS



UT Agricultural Extension Service
UT Center for Industrial Services
UT Experiment Station
UT County Technical Assistance Service
UT-Municipal Technical Advisory Service

UTAES
UT-CIS
UTES
UT-CTAS
UT-MTAS

The following text defines the programs that deal with landfills and solid waste issues.

Agrichemical manufacturers

Certain pesticide manufacturers participated in the program by being involved in the Model Site pesticide handling and mixing Demonstration facilities. Others requested technical assistance from TDA regarding regulatory compliance prior to construction of new facilities.

Appalachian Resource Conservation and Development Council (App-RC&D)

The Appalachian RC&D developed and administered the Nolichucky River Pesticide Awareness Project. As part of that project, they constructed at least two permanent facilities for the collection of plastic farm chemical containers for recycling, trained employees of farm stores in chemical safety and employed them as inspectors, and provided special labeling for pesticides which reminded farmers to triple rinse and recycle these containers. They also developed and distributed flyers and posters and a tabletop display for information/education and held presentations for farmers. This project was funded in part by 319 funds.

Through a 319 project, the Appalachian RC&D Council has partnered with other local entities to construct a centrally located pesticide container recycling center in northeast Tennessee. This facility was relatively inexpensive to build and maintain. Yet, more importantly, it will provide considerable recycling benefits for the local community as well as serve as a means of keeping hazardous substances from entering local waterbodies through sinkholes and streams. The seven (7) remaining RC&D Councils need to follow this lead in creating demonstration facilities across the state in an attempt to provide the impetus for even more facilities completely funded by local sources.

Austin Peay State University (APSU)

APSU and TDA-RS conducted a study of groundwater quality in the shallow vadose zone in the West Sandy Watershed. This project was partially funded with 319 funds. UTAES provided assistance in site selection and technical design. APSU was responsible for monitoring nutrients and pesticides after storm events, evaluating data, analyzing statistics, and sponsoring demonstrations to discuss the results and farm management implications with local farmers.

Brownfields Program

The Brownfields Program is an EPA program that directs funding towards cleaning up abandoned industrial sites that are not eligible for Superfund. The problems associated with abandoned industrial sites include solid waste or even landfills associated with an industry. Pollutants from these sites may include metals, chemicals, bacteria or nutrients.



Clinch-Powell RC&D Council (CP-RC&D)

Yet another example of locally led illegal dumpsite cleanup efforts is the FY-97 319 funded Clinch-Powell Illegal Dumpsite project in northeast Tennessee. This remote area has been without nearby sanitary landfill facilities for many years. Thus many illegal dumpsites were created out of necessity. Recent RC&D Council and other local entity efforts have created several convenience centers for dumping purposes as well as initiated the inventory, prioritizing, and cleaning up of several illegal dumpsites in this five county area. TDA-NPS Program needs to partner with the remaining seven RC&D Councils and KABs across the state to initiate other such water quality projects.

Development Districts

Nine (9) development districts exist across Tennessee to promote and assist in the growth of the areas they control. These districts have a vested interest in promoting clean water in the fact that future residents are more likely to move to their area if they know clean, usable water is readily available.

Keep America Beautiful (KAB affiliates)

Many litter cleanup campaigns have been completed in twenty-five (25) counties and six (6) cities by KAB staff members across Tennessee. This level of activity represents a strong stewardship for the environment and is a potential project partner by TDA-NPS Program.

The TDA-NPS Program has approached these KAB affiliates through Keep Tennessee Beautiful. Discussions to enlist their valuable support in land disposal related projects have taken place. A good example of this has been the submittal of the Duck River Illegal Dumpsite Inventory and Cleanup project which will be partially supported through FY-2000 Base 319 funds. This three part project will encompass citizen groups and KAB affiliates of five (5) Middle Tennessee counties with inventory and GIS tracking of all illegal dumps, prioritize eventual cleanup sites based upon their degree of water quality impact to local waterbodies, and the actual remediation of at least one (1) site per county.

Keep Blount Beautiful (KBB)

Several years ago Keep Blount Beautiful (KBB), initiated an illegal dumpsite inventory and cleanup project in the face of rising tipping fees. Citizenry involvement was gained at the outset, there was full support of dumpsite clean up and there was no increase illegal dumping to avoid paying a tipping fee. Eventually, some twenty-seven (27) sites were cleaned up, none of which have been illegally reused.

Keep Tennessee Beautiful Program/Univ. of Memphis (KTB)

Through a TDOT grant, Keep Tennessee Beautiful (KTB), formerly known as the Clean Tennessee Program, has been coordinating with 25 KAB affiliates to initiate litter clean-up projects. This program, housed at the University of Memphis (UM), has been in progress for several years, while its great success has landed them a spot on the governor's TLG Program.

Local watershed associations and citizens' groups

These groups become ambitious enough to adopt water quality projects as demonstrated by the biannual lake cleanup projects of the Boone Lake Association. Such associations can reduce the water quality impact of land disposal related pollutants



as they sponsor illegal dumpsite inventorying and cleanups, litter cleanups, and education/public awareness efforts in their areas.

The TDA-NPS Program should make every effort to strengthen existing ties with these local groups as well as initiate ties with newly created associations. On many occasions, these groups are a great source of voluntary workers to complete 319 projects.

Public Lands

Several federal agencies own property, yet are not considered water quality or funding agencies per se.. By doing so, these agencies comply with the intentions of the TDA-NPS Program.

- US Dept. of Defense-Army
 - Holston Ordnance Works
 - Volunteer Ordnance Works
 - Milan Arsenal
- US Dept. of Defense-Air Force
 - Arnold Engineering Development Center
 - Ft. Campbell Military Reservation
 - Millington Airbase
- US Dept. of Interior-Park Service
 - Cumberland Gap Historical Park
 - Great Smoky Mts. National Park
 - Big South Fork National River and Recreational Area
 - Chickamauga National Military Park
 - Stones River National Battlefield
 - Ft. Donelson National Military Park
 - Meriwether Lewis National Monument
 - Shiloh National Military Park
 - Natchez Trace National Parkway
- US Dept. of Agriculture-Forest Service
 - Cherokee National Forest
 - Land Between The Lakes National Forest
- US Dept. of Energy
 - Oak Ridge National Laboratories

Soil Conservation Districts (SCD)

The ninety-five (95) Soil Conservation Districts (SCDs) throughout the state actively support the NRCS and all of its water quality initiatives. The reuse of animal and human waste is no exception. The SCDs will assist the NRCS to make wise use of these natural resources, both in urban and rural settings. They may also form partnerships to initiate demonstration projects to further the use of these practices.

Tennessee Agricultural Production Association (TAPA)

TAPA provides outreach and education, as well as funding support. It is also a conduit for pesticide manufacturer's involvement.

TN Dept. of Agriculture-Ag. Resources Conservation Fund (TDA-ARCF)



The regional administrators with TDA-ARCF provide technical assistance in pesticide collection events, as well as providing information and outreach, logistics and project coordination.

TN Dept. of Agriculture-Regulatory Services (TDA-RS)

The TDA-RS has developed the State Pesticide Management Plan and is responsible for regulating the sale, distribution, storage, handling and use of pesticides in Tennessee. It has authority related to the prevention of pesticide contamination of Tennessee's water resources. It has also developed a pesticide recovery plan which includes: a pesticide collection program, building pesticide collection facilities, holding open houses and demonstrations for public awareness, publishing information about safe pesticide storage, handling and disposal, recycling pesticide containers and monitoring surface and groundwater to determine the extent of contamination by pesticides. The pesticide collection program and pesticide mixing facility projects were funded in part by 319 funds.

The TDA-RS works under the authority of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and the Tennessee Insecticide, Fungicide and Rodenticide Act (TIFRA). The Tennessee Valley Authority, EPA, and University of Tennessee Agricultural Extension Service, have assisted in developing programs for pesticide storage, mixing and collection. The TDA-RS has developed the State Pesticide Management Plan and is responsible for regulating the sale, distribution, storage, handling and use of pesticides in Tennessee. It has authority related to the prevention of pesticide contamination of Tennessee's water resources.

The mixing and storage programs include demonstration sites. The waste collection program was initiated in 1998 and will run for seven years. So far, 292,000 pounds of pesticides have been collected. In addition, pesticide container collection sites have been in place for a year. The containers will be chipped up and recycled.

The collection of unused agricultural pesticides in this program has substantially reduced the potential threat to the environment, wildlife and human health by preventing spills to surface and groundwater. Through the Household Hazardous Waste Collection program, an undetermined amount of urban pesticides have been collected, as well. And through the Nolichucky River Pesticide Awareness Project, several hundred pounds of pesticides and pesticide containers have been disposed of or recycled. The Shallow Vadose Zone and Groundwater Monitoring Project and the Constructed Wetlands for Pesticide Clean-up in Container Nurseries Project will not only help to prevent pollution at the source but will also serve as models for the future.

In addition, the model storage and mixing facilities are permanent for future collections. One of the most important contributions of the Statewide Pesticide Program may be statewide education efforts, which will serve to educate farmers and landowners about the proper storage and disposal of pesticides.



TDEC-Division of Community Assistance (TDEC-DCA)

Household pesticides and other hazardous chemicals are collected periodically at different sites in the state by TDEC-Division of Community Assistance (DCA). This effort is an attempt to properly recycle containers so they will not be discarded near water resources or disposed in landfills when recycling is more appropriate. TDEC-DCA sponsors and coordinates the Solid Waste and Household Hazardous Waste Collection Program and provides information/education materials, and offers technical assistance.

TDEC-Division of Solid Waste Management (TDEC-SWM)

In 1969, the Tennessee Solid Waste Management Act was adopted in order to initiate a comprehensive statewide program for the regulation of solid waste management. This Act has been modified and amended over the years and it, along with associated acts such as the 1991 Solid Waste Management Act and the Solid Waste Authority Act, now form the statutory framework for solid waste regulations in Tennessee. TDEC-SWM and TDEC-WPC have a Memorandum of Understanding to address sites which have adverse affects on local water quality.

TDEC-Division of Water Pollution Control (TDEC-WPC)

TDEC-WPC is the state's leading water quality monitoring agency and is responsible for preparing the 1998 303(d) List and the 305(b) Report . As TDEC-WPC discovers water quality impairments due to land disposal issues, it can alert the partnership so that remediative actions can be taken. It is also standard procedure for TDEC-WPC to treat all illegal dumpsites as point sources once discovered. It is also critical to the success of a countywide or multi-county cleanup effort to have the regional and central office staff assist the local organization in prioritizing the cleanup.

TDEC-Division of Water Supply (TDEC-DWS)

The Ground Water Management Section of TDEC's Division of Water Supply (TDEC-DWS) has been charged with the responsibility of managing the Source Water Assessment Program (SWAP). A contract has been made with the Tennessee Association of Utility Districts (TAUD) to complete a surveys along a two thousand foot wide by 5 mile long cooridor upstream of every public and private water intake in the state. Information gathered during this survey consists of any point or nonpoint sources of water pollution. This information is recorded for GIS storage and presentation and can be used by local and state groups in projects related to illegal dumpsites, abandoned landfills, failing septic systems, and incidences of improperly spread municipal and/or animal waste.

Tennessee Department of Transportation (TDOT)

TDOT's Highway Beautification Office (HBO) works to keep trash off of the state's highways with the Adopt-A-Highway program, which makes use of volunteers and the Litter Grant Program. They also plant and maintain vegetation in the medians of and along side highways and regulate junkyards along interstates, parkways and scenic highways. In addition, TDOT's HBO provides educational displays such as the "Litter Bug" (a Volkswagen filled with trash) and a walk-through recycling van (with examples of recycled products).



Tennessee Farmers Cooperative (TFC)

This organization provides public outreach and education about the proper handling of pesticides and herbicides and serves as a means for retail supplier involvement with the TDA-NPS Program.

Tennessee Golf Course Superintendent's Association (TGCSA)

Several golf courses elected to participate in the pesticide storage and collection program by building storage facilities and establishing riparian zones between the golf courses and waterbodies.

Tennessee Nurserymen's Association (TNA)

The owner of one of the largest nurseries in Tennessee, Shadow Nursery in Winchester is a member of the Tennessee Nurserymen's Association. This site contains 15 retention ponds, which collect storm water and are used for irrigation. Over 2,000 nurserymen from all over the world visit Shadow Nursery to purchase plants or discuss new developments in technology. A model site was built at this nursery and demonstrations there will serve to further promote environmental awareness among nurserymen.

Tennessee Resource Conservation and Development Districts (TN-RC&D)

The RC&Ds promote environmentally sound development in their areas and have worked with the TDA-NPS Program on many water quality projects. The RC&Ds (such as the CP-RC&D and App-RC&D, mentioned earlier in this section) are addressing the issues of solid waste disposal and recycling. They should continue to address these issues, helping to promote public awareness of waste management and recycling across the state.

Tennessee Technological University (TTU)

TTU contracted with the TDA-NPS Program to control runoff containing pesticide residues from container nurseries by using constructed wetlands. The function of the wetlands was to contain pesticides and nitrites in runoff and prevent them from infiltrating surface and groundwater. Water quality was monitored in a mock-up nursery as part of the study. This project has been implemented as a demonstration project at an actual nursery operation.

Tennessee Valley Authority (TVA)

The TVA provides funding support, assists in program development and management, and provides media and public information and education. They have also provided technical assistance in engineering, hazardous waste operations and other projects. TVA also assisted in developing contacts, selecting collection sites, developing educational materials, conducting hazardous waste handling training for TDA personnel, coordinating and providing technical oversight for collection events in the pesticide collection program.

USDA-Natural Resources Conservation Service (NRCS)

The NRCS assists TDA regional administrators in project coordination and site selection. They also provide information about pesticide collection and handling in informational brochures and on their Internet site (www.usda.nrcs.gov).



UT Institute of Agricultural (UTIA)

The UTIA has for many years recognized the fact that human waste from septic systems, in addition to animal waste, significantly contributes to the pollution of both surface and subsurface water resources across the state. APSU and UTIA worked on the Shallow Vadose Zone Project, providing technical assistance. UTIA has participated in well water monitoring at one location in Bedford County, in an effort to determine the origin of high fecal and nutrient loadings to local surface streams and subsurface aquifers.

UTIA offers the Farm*A*Syst/Home*A*Syst program to farmers and landowners to provide education about water quality protection and improvement on the farm and around the home. This program includes written materials, videos, CD-ROMs, and a web site. The Farm*A*Syst/Home*A*Syst project was funded in part by 319 funds.

UT County Technical Advisory Service (UT-CTAS)

CTAS assists county officials with programs addressing the disposal of solid waste, county-wide recycling efforts, and household or agricultural chemical disposal.

UT Municipal Technical Advisory Service (UT-MTAS)

MTAS assists local governments with solid waste issues.

OTHER FUNDING SOURCES

Inventorying, prioritizing, and cleanup of illegal dumpsites

TDA-NPS Program, through it's relationship with Keep TN Beautiful and Keep America Beautiful will likely see projects similar to those previously funded be done in other parts of the state.

Local efforts are rapidly growing to contend with the problem as is exemplified by the Citizens for Lincoln County Environment and Neighborhood (CLEAN). These efforts should heighten the awareness of citizens to the importance of keeping solid waste away from waterbodies and sinkholes.

Additional funding sources for environmental projects are listed in the Catalog of Federal Funding, which can be found at: www.aspe.os.dhhs.gov/cfda

CURRENT 319 PROJECTS

Currently the TDA-NPS Program is:

- Involved in one illegal dumpsite clean-up project, while having submitted a project which should involve five counties and assist the Keep Tennessee Beautiful program,
- becoming active in illegal dumpsite remediation across the entire state
- Involved in projects which assist in the collection of used or disgarded pesticied containers.

The following is a compilation of these efforts.



Grant Yr.	Project Title	Location
FY-97	C-P Illegal Dumpsites	northeast
FY-98	Statewide Collection Pesticide Containers	statewide
FY-00	Duck River: Dumpsite Inventory & Cleanup	Middle TN
FY-00	Statewide Collection of Pesticides	statewide

EDUCATION AND PUBLIC AWARENESS

The UT Institute of Agricultural (UTIA) is a prominent partner for the creation of educational brochures and the coordination of field days. These activities communicate information concerning all of the land disposal issues to state citizens. Land disposal projects possess valuable aspects, which need to be captured in some kind of educational media, such as brochures, booklets, videos, internet sites, CD-ROMs or field tours. In this manner, others can learn from the projects supported by 319 and other clean water funding programs.

AREAS FOR PROGRAM EXPANSION

Promotion of State Revolving Funds (SRF) in BMP implementation

EPA has encouraged 319 programs to use, when possible, SRF funds to address nonpoint source problems. As partners discuss solutions to land disposal problems, the SRF Program could be a source of funding for the solutions.

Collection and reuse of timber industry waste

For quite some time Tennessee has been a leader in hardwood production. Along with this has come a significant collection of refuse piles. Much of this refuse has been reused in other wood-related industries, but large amounts of refuse still remain across the state. If left exposed to the elements it can be a potential cause of water quality impairment.

Investigative studies into the reuse of these refuse piles need to be performed to learn how this material could be utilized as a beneficial natural resource, such as a soil amendment. Work with UTIA, NRCS, SCDs, among many others could result in useful information.

WATER QUALITY MONITORING & ASSESSMENT

TDEC-Division of Water Pollution Control

Currently, 319 funds are being awarded to TDEC-WPC to increase the density and coverage in their water quality monitoring scheme. As land disposal related sites are found and delineated as having water quality impairment possibilities the TDEC-WPC monitoring effort should focus on these sites to determine their effects on water quality. If it is proven that these sites do cause impairment BMP implementation should occur and follow-up monitoring should proceed to determine if this effort was sufficient in negating the original impact of the land disposal site. These efforts should be coordinated between TDEC-WPC and the implementing agency.



TDEC-Division of Water Supply

Monitoring data collected by the TDEC-DWS for the SWAP program may be utilized for assessing problems and needs in affected watersheds. Through the SWAP effort, reconnaissance surveys are completed along a two thousand foot wide by five mile corridor upstream of every public and private water intake site in the state. Information gathered during these surveys consists of any point and/or nonpoint sources of water pollution.

Groundwater Monitoring

In addition to those two agencies, groundwater monitoring has been done independently by several different organizations. Runoff from solid waste sites, pesticides applied to crops and lawns, and sludge or animal wastes applied may leach into groundwater, contaminating the water supply with nutrients, metals, bacteria and chemicals. The TDA-NPS Program monitored groundwater in two priority watersheds, Loosahatchie River/Beaver Creek and Duck River for hydrocarbons, pesticides, nutrients and bacteria during 1994-95. TDA Division of Regulatory Services also monitored groundwater for pesticides in West Tennessee. TVA, in cooperation with UTIA, monitored groundwater in the Duck River watershed for nutrients and bacteria. In addition, the USGS did an extensive groundwater monitoring of Loosahatchie River/Beaver Creek to identify levels of bacteria, nutrients and pesticides.

ENFORCEMENT MECHANISMS

Tennessee Department of Environment and Conservation is comprised of several divisions, two of which are assigned the task of regulating many land disposal activities. The following text highlights the enforcement responsibilities of these divisions.

TDEC-Division of Solid Waste Management

Solid waste regulations are enforced by TDEC-SWM via State of Tennessee Rule 1200-1-7. Regulatory efforts have proven to be quite beneficial to the quality of local surface and ground water resources. These efforts include: proper planning, use of basal liners when needed, peripheral monitoring wells, methane collection systems when feasible, pre-packing recycling sorting, standard packing and covering regulations, standard closing procedures, and post-closure monitoring.

TDEC-Division of Water Pollution Control

TDEC-WPC is also responsible for responding to public water quality complaints that could arise from land disposal activities and attempt to independently find these problems during the course of their assessment efforts. Once violations to the state's water quality law have been discovered by TDEC-WPC, enforcement procedures against the operator or landowner are enacted to remedy the problem. TDEC-WPC is responsible for enforcing water quality regulations through State of Tennessee Rule 1200-4-3 and the Tennessee Water Quality Control Act.

MEASURES OF SUCCESS

- Numbers of streams listed on the 1998 303(d) List because of landfills and other solid waste issues decrease with each subsequent list
- Number of illegal dumpsite inventory and clean-up projects increase biennially



- increase in the numbers of participants of household hazardous waste collection events
- Increase in attendance at pesticide collection events
- Increase in the distribution of educational publications, videos, CD-ROM, and internet sites relating to proper pesticide storage and disposal and proper solid waste disposal

MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, to strengthen existing partnerships, and to foster greater trust, commitment and accountability.

- **Action 1:** The Land Disposal Working Group (LDWG) will meet semi-annually.
Lead: TDA-NPS Program
Key partners: TDEC-SWM; TDEC-DCA; TDA-RS; UTIA; TDOT; KTB; KAB; TNRC&D
Year(s): 2001 – 2005
- **Action 2:** Increase LDWG membership by one member each year.
Lead: TDA-NPS Program
Key partners: TDEC-SWM; TDEC-DCA; TDA-RS; UTIA; TDOT; KTB; KAB; TNRC&D
Year(s): 2001 – 2005
- **Action 3:** Establish the LDWG mission statement, a list of collective capabilities, and priorities for funding.
Lead Agencies: LDWG and TDA-NPS Program
Key partners: TDEC-SWM; TDEC-DCA; TDA-RS; UTIA; TDOT; KTB; KAB; TNRC&D
Year(s): 2001-2005
- **Action 4:** Develop Memoranda of Agreement with key federal agencies to improve programmatic consistency.
Lead: TDA-NPS Program
Key Partners: All federal agency partners
Year(s): 2001-2005

Long Term Goal 2.

Fully implement all developed TMDLs for nonpoint sources in compliance with existing regulations, policies, or agreements by 2015.

- **Action 1:** Coordinate water quality remediation efforts between TDEC-WPC and TDA-NPS Program with the development of Land Disposal-related TMDLs, researching a unified approach in setting TMDL standards.
Lead: TDEC-WPC & TDA-NPS Program
Key partners:
Year(s): 2001
- **Action 2:** Provide information concerning TMDL development to the LDWG,



to gain their participation.
Lead: TDA-NPS Program
Year(s): 2001-2005

- **Action 3:** Provide necessary input to TDEC-WPC concerning nonpoint issues on 100% of waters selected for TMDL development.
Lead: TDA-NPS Program
Year(s): 2001-2005
- **Action 4:** Create an implementation plan for any TMDL developed by TDEC-WPC involving pollutants originating from Land Disposal nonpoint sources.
Leads: TDA-NPS Program, TDEC-WPC
Key Partners: LDWG
Year(s): 2001-2005

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- **Action 1:** Install BMPs so that 20% of the streams impaired due to land disposal on the 1998 303(d) List will support their designated uses.
Lead: TDEC-WPC
Key partners: TDEC-SWM; TDEC-DCA; TDA-RS; UTIA; TDOT; KTB; KAB; TNRC&D
Year(s): 2005
- **Action 2:** Install BMPs so that 60% of the streams impaired due to land disposal on the 1998 303(d) List will support their designated uses.
Lead: TDEC-WPC
Key partners: TDEC-SWM; TDEC-DCA; TDA-RS; UTIA; TDOT; KTB; KAB; TNRC&D
Year(s): 2010

Long Term Goal 4.

Beginning in 2006, through regulatory and non-regulatory means, prevent previously unlisted waters from being included on the 303(d) List because of nonpoint source impairments.

- **Action 1:** Implement BMPs on streams not listed on the 1998 303(d) List
Lead: LDWG & TDA-NPS Program
Key partners: TDEC-SWM; TDEC-DCA; TDA-RS; UTIA; TDOT; KTB; KAB; TN
Year(s): 2001-2005
- **Action 2:** Provide funding to projects that will keep waters from being 303(d) Listed due to Land Disposal.
Lead: TDA-NPS Program
Key partners: TDEC-SWM; TDEC-DCA; TDA-RS; UTIA; TDOT; KTB; KAB; TNRC&D
Year(s): 2005

Long Term Goal 5.



Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution, and how to prevent it.

- **Action 1:** Develop and distribute educational material concerning Land Disposal issues in increasing amounts each year.
Lead: TDA-NPS Program
Key partners:
Year(s): 2001-2005
- **Action 2:** Through 319 demonstration projects across the state, encourage local entities to create projects to remediate improper Land Disposal sites which are affecting local water quality.
Lead: TDA-NPS Program
Key partners:
Year(s): 2001-2005
- **Action 3:** Participants in household hazardous waste collection events will increase each year.
Lead: TDEC-DCA
Key partners: TDEC-SWM
Year(s): 2001 – 2005
- **Action 4:** Pesticide collection events will occur in all 95 counties.
Lead: TDA-RS
Key Partners: TVA, TDA-NPS Program
Year(s): 2005
- **Action 5:** At least two model sites for the Pollution Prevention Program will be constructed.
Lead: TDA-RS; TVA
Key Partner: TDA-NPS Program
Year(s): By 2005
- **Action 6:** Provide educational information concerning Land Disposal on the TDA-NPS web page.
Lead: TDA-NPS
Year(s): 2001

Long Term Goal 6.

Through the process of continuous improvement, routinely assess all programmatic functions of the TDA-NPS Program in order to maximize efficiency, decrease the bureaucratic burden and increase the numbers of participants in the program.

- **Action 1:** Investigate other funding sources such as The Nature Conservancy, Brownfields Program, as well as EPA.
Lead: TDA-NPS Program
Key partners: The Nature Conservancy; US EPA
Year(s): 2001-2005



- **Action 2:** Provide responses to all project related inquiries from grantees within three business days of the request.
Lead: TDA-NPS Program
Year(s): 2001-2005
- **Action 3:** Work with grantees to achieve timely submittal of all progress reports 100% of the time.
Lead: TDA-NPS Program
Year(s): 2001-2005
- **Action 4:** Develop a Priority Ranking System for project review.
Lead: TDA-NPS Program
Year(s): 2001-2005
- **Action 5:** Request feedback from partners annually to assess the quality of the TDA-NPS Program
Lead: TDA-NPS Program
Year(s): 2001-2005

Long Term Goal 7

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

See Chapter 1.9 for action items related to water quality monitoring for the TDA-NPS Program

INTRODUCTION



This chapter describes education and public awareness efforts by various local, state, federal and private organizations.

The Clean Water Act was passed in 1972 and reauthorized in 1987. The Nonpoint Source Program was created as part of that reauthorization. Environmental laws passed since 1972 have served to greatly reduce the pollution from industry and municipalities, but nonpoint source pollution (nps), created by all of us from farmers to homeowners, remains a problem. Education has always been an important part of the TDA-NPS Program, since it is non-regulatory.

EXTENT OF PROBLEM

Although nonpoint source pollution is the most prevalent type of water pollution, there is much confusion about what nonpoint source pollution is. Many people incorrectly blame nonpoint source water pollution on industry or are not familiar with the words, “nonpoint source pollution”. There is a great need for public education on water quality issues, particularly nonpoint source pollution. The challenge is to become aware of the different education programs across the state and to share information with other agencies so that all persons involved can work together to raise public awareness of water quality and nonpoint source pollution.

SOLUTIONS

Most agencies that are involved with water quality protection have some type of educational component. Different agencies and organizations coordinate education efforts to some extent. Coordination will be increased through meetings of the Education Working Group. Education efforts include publications such as pamphlets, booklets, posters, manuals and videos; information on Internet sites and CD ROMs; public awareness events such as water festivals or Earth Days; presentations; media coverage from TV, radio and newspapers. Other projects include demonstration projects where participants are invited to view BMPs and learn about water quality protection, and workshops and training seminars.

Publications are distributed at events such as Earth Day or environmental fairs, or are sent out on request. New publications that are targeted to a specific group (such as BMP manuals for developers or farmers) are usually distributed throughout the state to regional offices (such as NRCS offices). Often, an initial distribution generates requests for additional publications.

Demonstration projects are advertised through the media and mail-outs to target audiences and are usually organized as a joint effort between agencies. Participants are invited to a specific farm or area where BMPs have been implemented or installed and are provided information about them. Projects may focus on a specific problem such as forestry BMPs or they may cover nonpoint source pollution in general. Some projects

1.8 EDUCATION & PUBLIC AWARENESS

focus on elementary or high school students, others are for adults. Projects may be targeted for a specific audience such as farmers, landowners, or foresters. The following is a list of our partners and description of projects.

Most of the NPS Program's outreach projects are targeted to adults. Project WETT is offered to teachers and facilitators who in turn teach students. The NPS Program has developed an instream education manual in an effort to standardize activities across the state. The target audience for this manual is also teachers and facilitators, as are the Ag in the Classroom projects. Specific projects such as Project WETT or Ag in the Classroom are administered by the project managers, representatives from an agency or agencies responsible for managing the program. Publications may be designed for a specific audience (such as farmers or foresters) or may be aimed at the general public.

COOPERATING PARTNERS**Partners**

Austin Peay State University
 Boone Watershed Partnership
 Cumberland River Compact
 Environmental Protection Agency
 Great Smoky Mountains Institute at Tremont
 Ijams Nature Center
 Izaak Walton League
 Metropolitan Areas (Chattanooga, Knoxville Memphis, Nashville)
 Mid-South Fly Fishers
 Motlow State Community College
 Tennessee Aquarium
 Tennessee Conservation League
 Tennessee Department of Agriculture
 Agricultural Resources Conservation Fund
 Division of Forestry
 Tennessee Department of Education
 Tennessee Department of Environment and Conservation
 Division of Water Pollution Control
 Division of Community Assistance
 Tennessee Environmental Education Association
 Tennessee Farm Bureau
 Tennessee Higher Education Council
 Tennessee Resource Conservation and Development Councils
 Tennessee State University
 Tennessee Technological University
 Tennessee Valley Authority
 Tennessee Wildlife Resources Agency
 The Nature Conservancy
 University of Memphis
 University of Tennessee Institute of Agriculture
 University of Tennessee Water Resources Research Center
 USDA Natural Resources Conservation Service
 US Geological Survey

Abbreviation

APSU
 BWP
 CRC
 EPA
 GSGMIT
 INC
 IWL

 MSFF
 MSCC
 TN-AQ
 TCL
 TDA
 -ARCF
 Forestry
 TDE
 TDEC
 -WPC
 -DCA
 TEEA
 TFB
 THEC
 TNRC&D
 TSU
 TTU
 TVA
 TWRA
 TNC
 UM
 UTIA
 UTWRRC
 NRCS
 USGS



Williamson County Schools

WCS

Austin Peay State University (APSU)

The NPS Program has been working with APSU's Center for Excellence in Field Biology for several years. Through contracts with the NPS Program, APSU has worked with the local NRCS in holding field days to demonstrate BMPs and has held educational workshops on riparian restoration and water quality monitoring with juvenile mussels. APSU contracted with the NPS Program to coordinate the Water Education for Tennessee Teachers (WETT) Program, which is the State's chapter of the national organization, WET. WETT teaches water quality education through workshops and free materials for facilitators and teachers, helping to incorporate water quality education into the school curriculum.

Boone Watershed Partnership (BWP)

BWP has an Adopt a Watershed program at several high schools in the area where students monitor the water quality and learn about causes of water pollution and how to prevent it.

Cumberland River Compact (CRC)

CRC is a citizen's group that promotes stewardship of the Cumberland River by publishing articles, publications and holding events such as the Splash Bash. Among their projects is a publication that reinterprets the 303 (d) list, making it more user friendly. It also maintains a Water Quality Advisory Committee to provide technical expertise. Members of this group are from TDEC-WPC, TDA-NPS Program, USCOE, TWRA and Metropolitan Nashville/Davidson County Water Department. The CRC used USCOE maps and TDEC-WPC data to determine what areas of the river are being impaired and presented this information at public meetings.

Environmental Protection Agency (EPA)

The EPA is the primary federal water quality agency, providing funding for the NPS Program and setting its guidelines. Education is an important component of the EPA. The agency sponsors several workshops and conferences and publishes many educational tools for all age groups.

Great Smoky Mountains Institute at Tremont (GSMIT)

GSMIT is an environmental school, which features several courses a year. This includes classes for adults as well as for children. Programs focus on everything from wildlife to environmental ethics. All Tremont programs are operated by the Great Smoky Mountains Natural History Association in cooperation with the Great Smoky Mountains National Park.

Ijams Nature Center (INC)

Ijams Nature Center is a nonprofit environmental education and resource center located on 80 acres on the banks of the Tennessee River in Knoxville. Among their programs are the River Rescue, an annual volunteer river clean-up effort and Storm Drain Stenciling projects. The center offers workshops such as Project WILD for teachers as well as workshops for children ages two to eighteen.



Izaak Walton League (IWL)

The IWL was founded in 1922 as an organization of conservation-minded outdoor enthusiasts who work through voluntary community-based action and education programs. Save Our Streams (SOS) is one of the programs sponsored by the IWL. SOS is a grassroots river conservation program that works through volunteers who monitor water quality in streams and provide education programs. The Tennessee chapter of IWL will be able to provide input through the EWG as IWL has an extensive list of environmental publications.

Metropolitan areas, (Chattanooga)

The City of Chattanooga has an educational program for children that uses the character, C.C. Otter, to teach water quality issues. They have published a manual and pamphlets about storm water BMPs, and have received State and national recognition and awards for their program.

Mid-South Fly Fishers (MSFF)

MSFF is a group of fly fishers based out of Memphis, Tennessee, that recognizes that the future of fly fishing depends on clean water. They are the sponsors of Water Education Teams (WET), a water education program that involves high school students in water quality monitoring. In addition, MSFF has established the Mid-South Fly Fishers Scholarship Foundation, which is committed to provide scholarships of \$1,000 per year for four years to senior students who have participated in WET and intend to pursue a career in ecology or science.

Motlow State Community College (MSCC)

Dr. Linda Harris-Young, with MSCC, developed a database of community colleges across Tennessee who are participating in, or interested in in-stream education. This database will assist the NPS Program in coordinating a statewide in-stream education effort. The EWG can use this as tool for networking ISE information, as well as for other nonpoint source issues.

Resource Conservation and Development Councils (TNRC&Ds)

The RC&Ds are funded by the U.S. Department of Agriculture and work to promote economic growth and conservation efforts on a local level. All of the seven RC&Ds in Tennessee address natural resources conservation and most are or have been under contract with the TDA-NPS Program. The RC&Ds sponsor the Tennessee Envirothon, an environmental competition for high school students. The Envirothon is partially funded by 319 (h) funds. Regional competitions are held first in each of the RC&D council areas, then a state and national competition are held. The RC&Ds also sponsor other workshops, such as Conservation Camp (for fifth graders). In addition, the RC&Ds establish projects to implement BMPs such as riparian zone restoration.

Tennessee Aquarium (TN-AQ)

The Tennessee Aquarium offers environmental education (including water quality) opportunities to students and teachers through onsite classes, outreach programs and Internet video conferences. Local teachers have access to water quality related videos and CD-ROMs through the Environmental Learning Lab.

**Tennessee Conservation League (TCL)**

TCL has been an active partner with the TDA-NPS Program and through a contract, produced pamphlets, posters, brochures and a video. The TCL is still involved with environmental education and has co-sponsored Project WILD, Aquatic Wild and PLT as well as other workshops. They produce a newsletter and hold an annual meeting where awards are given to environmentally conscious individuals and businesses.

Tennessee Department of Agriculture Ag. Resources Conservation Fund (TDA-ARC)

TDA-ARC provides another source of funding for implementing nonpoint source BMPs. The Regional Administrators with this program are environmental specialists in different areas of the state who work with the Soil Conservation Districts to give technical assistance to farmers and landowners. TDA-ARC allocates up to 5 % of its total funding per year for information/education projects with the target audience being landowners, producers and managers. TDA-ARC funds agricultural and forestry BMPs.

Tennessee Department Agriculture-Forestry Division (TDA-Forestry)

TDA-Forestry has a very extensive education program and has been working with the TDA-NPS Program since 1990. The TDA-NPS Program has funded this program through 319 funds and plans to continue this funding. The Master Logger Program is a workshop set up through the TDA-Forestry to train foresters and loggers in forestry BMPs. Each year several workshops are held across the state, both Master Logger workshops and other training workshops. In addition to training forestry and lumber industry personnel, TDA-Forestry also held a BMP training course for TWRA personnel. Portions of two forests, Chuck Swan and Natchez Trace, have been set aside for demonstration of BMPs. A BMP study was also done in Pickett State Park. Additional demonstration sites are planned through FY-2001. These sites will be funded through 319 (h) funding. TDA-Forestry also provides technical assistance to loggers and foresters and have produced several publications including pamphlets, brochures, booklets, handbooks and videos.

Tennessee Department of Education-Office of Conservation Education (TDE-OCE)

TDE has co-sponsored environmental education programs such as Project WILD, Project Aquatic WILD and Project Learning Tree (along with TDA-Forestry) in the past and was formerly an active partner with the TDA-NPS Program. Project WILD workshops are offered to teachers to provide curriculum materials about wildlife, Aquatic WILD focuses on water quality and aquatic wildlife, and Project Learning Tree teaches forestry concepts. It would be advantageous for TDE-OCE to be a part of the Education Working Group and serve to review curricula appropriateness in materials developed by other agencies.

Tennessee Department of Environment and Conservation Division of Water Pollution Control (TDEC-WPC)

The TDA-NPS Program works closely with TDEC-WPC. WPC's Watershed Approach includes public meetings in each of the watersheds. At the public meetings, citizens are given the opportunity to provide input about the watersheds in their area. As the State's lead water quality organization, TDEC may help sponsor educational water quality programs. WPC takes part in TDEC's department-wide events such as environmental fairs and publishes articles, pamphlets and other publications about water pollution

1.8 EDUCATION & PUBLIC AWARENESS



control. A primary publication is the 303 (d) list of impacted waters which is available to the public.

Tenn. Dept. of Environment and Conservation Division of Community Assistance (TDEC-DCA)

The TDEC sponsors a Pollution Prevention fair annually and the DCA plays a large part in this effort. They have also created publications such as pamphlets to inform the public about pollution prevention.

Tennessee Environmental Education Association (TEEA)

TEEA is a non-profit organization dedicated to promoting environmental education in Tennessee. They do this by sharing educational information; promoting research, development and evaluation of environmental programs, materials and activities; raising public awareness of the natural environment through interpretive programs and encouraging public understanding and support of environmental education programs and activities. Their newsletter addresses water quality issues. They work with public schools to include environmental education in the curriculum and lend support to and seek cooperation from institutions, organizations and agencies in matters pertaining to environmental education.

Tennessee Farm Bureau (TFB)

The Farm Bureau created the Ag in the Classroom (AITC) program (partially funded by 319(h) funds), which teaches elementary students about agriculture and includes information about agricultural BMPs. The educational materials were created by Farm Bureau and their partners. Workshops are held for teachers and educators once a year at universities, and locally at any time. The participants of the AITC programs are required to hold workshops after they have been trained, so the number of trained facilitators grows exponentially. In an average year, ten workshops were held at universities and eight were held locally, with almost 700 facilitators being trained. In addition to AITC, the TFB also offers farm tours and Farm Days through November each year.

Tennessee State University (TSU)

TSU holds Earth Days annually in conjunction with Spring Fling. In the past, the TDA-NPS Program has participated by setting up its educational display and distributing educational materials.

Tennessee Technological University-The Water Center (TTU)

The TDA-NPS Program contracted with TTU in the Cane Creek Lake and Park Stabilization Education Project. The project included demonstration of different cover types on critical areas around the lake and signage to inform the public about the details of the project and the importance of water quality protection. In a related project urban runoff is addressed by constructing a BMP on a parking lot to remove petroleum hydrocarbons. Another project demonstrates constructed wetlands as a means to remove pesticides and nutrients from runoff from container nurseries. A pamphlet delineating construction, operation, maintenance, and costs of constructed wetlands is included in this educational project.



Tennessee Valley Authority (TVA)

TVA has had a very well developed environmental education program. Their Watershed Resource Teams worked with landowners, local communities and businesses, interest groups, and public officials to find ways to protect water quality without limiting the rivers' use. In 1994, TVA launched the Clean Water Initiative to help make the Tennessee River System the cleanest and most productive. Since then, decreased funding has resulted in the land programs and water programs being combined into the Resource Stewardship program, which is separated into watershed teams. They do not have an active education program as in the past, however, they developed the original manual that the TDA-NPS Program is using for its Instream Education Program.

Tennessee Wildlife Resources Agency (TWRA)

TWRA has a Water Quality Education section that has been very active years. The NPS Program funded a contract with TWRA in 1992 to hold nonpoint source education workshops in every selected watershed, plus the Nashville area. These workshops were attended by teachers and educators. As part of the workshops, attendees visited BMP demonstration sites and took part in water quality monitoring. Participating in hands-on activities gave participants a richer experience that they were then able to take back to the classroom to their students. TWRA also has their own publications, which make mention of pollution prevention and water quality, including a video, *Water Quality: Every Fisherman's Concern*. As mentioned earlier, TWRA personnel attended Forestry Water Quality BMP training. TWRA has also been involved in several riparian restoration efforts. Free Fishing Day is an annual event when fishing is allowed without a license and public education activities are included, along with an educational display.

The Nature Conservancy (TNC)

TNC's goal is the long-term survival of all viable native species and community types through the design and conservation of protection sites within ecoregions. They promote water quality education by buying and protecting pieces of land. Assessing biodiversity and publishing the results of the studies are important components of their program.

University of Tennessee Agricultural Extension Service (UTAES)

UTAES is a division of the UT Institute of Agriculture. UTAES brings research-based information on agriculture, community resource development and home economics to Tennesseans. There are specialists in all 95 counties to provide technical assistance, and UTAES has published a variety of publications on educational information. UTAES contracted with the TDA-NPS Program to produce the Farm-A-Syst and Home-A-Syst programs, including videos, an agricultural and forestry BMP manual for Tennessee, and a CD-ROM and Internet site.

University of Tennessee-Water Resources Research Center (UTWRRC)

UTWRRC has two active contracts with the NPS Program, the Second Creek Stream Restoration Project and the Stormwater Management BMPs manual. The Second Creek Project involves restoring the riparian zone to areas that were in need of restoration. The Stormwater Management manual provides detailed information about BMPs to manage storm water. UTWRRC also teamed up with the Knoxville Water Quality Forum to create an Adopt-A-Watershed program in which several schools participated.



USDA Natural Resources Conservation Service (NRCS)

The NRCS has long been active in environmental education and was instrumental, along with EPA, in forming the Clean Water Action Plan in 1998. They have published many publications dealing with water quality and BMPs, such as “Backyard Conservation”, a booklet which addresses water quality concerns of homeowners and BMPs to address nps pollution associated with urban runoff and gardening. They have educational programs for children with characters such as Sammy Soil and Ruby Raindrop to help teach the importance of soil conservation and erosion control. The NRCS has many programs, which provide technical and financial assistance to farmers and landowners. These programs encourage the implementation of BMPs such as conservation buffers along streams. In addition, the NRCS sponsors the RC&D councils.

U.S. Geological Survey (USGS)

Water quality is an important concern of the USGS, which monitors water quality and stream flow data in several stations throughout the nation. The Water Resources Education Initiative (WREI) is an educational outreach program designed to promote interest in fresh water resources for students and educators in grades K-12. It makes use of educational materials and activities to teach students about water, how man’s activities affect it, and how to make informed decisions in their own communities. The educational posters were developed and distributed by the USGS and WREI partners which include the EPA, the American Water Resources Association, the Groundwater Foundation, the U.S. Fish and Wildlife Service, and the U.S. Army Corps of Engineers. In addition, the USGS has published many environmental fact sheets and has an interactive web site with a section on water.

Williamson County Schools–Special Education Program (WCS)

The WSC System has an extremely active water education program. The NPS Program has contracted with it to form the Students in Tennessee Assessing Rivers (STAR) Project, which is part of the larger Harpeth River Environmental Education Project (HREEP). HREEP began as a local extension of the Global Rivers Environmental Education Network (GREEN), a national educational organization. STAR incorporates water quality education into all subject areas from math and natural science to computer science to the creative arts. It includes getting the students involved in hands-on activities such as water monitoring and writing their own newsletter and giving presentations at conferences. STAR and HREEP have won state and national awards for their considerable efforts in environmental education.

OTHER FUNDING SOURCES

Tennessee Higher Education Commission

The THEC has funded the Tennessee Aquarium with various grants to enable them to work with teachers in improving water quality.

Federal Sources

Many sources of additional funding are listed at www.aspe.os.dhhs.gov/cfda
The EWG will provide a listing to potential partners.



Additional funding sources for environmental projects are listed in the Catalog of Federal Funding, which can be found at: www.aspe.os.dhhs.gov/cfda

AREAS FOR PROGRAM EXPANSION

Media Coverage

Surveys done by other states indicate that media coverage has helped to greatly increase public awareness of water quality issues. The most effective media were newspapers, followed by television. Increasing media coverage at field days, demonstrations, workshops, and other events should help increase public awareness of nps issues. In addition, information will be covered by our web site, magazine articles and publications.

Urban Runoff & Construction

Urban runoff has been receiving more publicity and more funding for projects during the last few years and this trend needs to continue. There have been many education/information efforts focused on other types of nps pollution such as agriculture and forestry. However, with the growing conversion of rural land to urban, this type of runoff is widespread. Also, environmental education programs seem to be lacking in many metropolitan areas.

Another issue is “green growth”. This is a development trend to that incorporates best management practices at the building stage. These BMPs include limiting impervious surfaces and providing means of retaining runoff. The NPS Program is working on a manual for construction/urban runoff BMPs such as these.

Land Disposal

Land disposal includes landfills, failing septic tanks, illegal dumps and applied biosolids. This issue has not been addressed as much as other sources of nps. Information/education components should be included in land disposal programs.

MEASURES OF SUCCESS

- The Education Working Group meets twice a year to discuss and determine the strengths and weaknesses of the statewide educational efforts.
- Education issues are discussed in a breakout session at the annual Partnership Conference.
- Additional sources of funding are earmarked for various types of educational projects .
- Awareness among citizens is increasing, as measured through surveys.



MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partners, to strengthen existing partnerships, and to foster greater trust, commitment and accountability.

- **Action 1:** The Education Working Group (EWG) will meet semi-annually.
Lead: TDA-NPS Program
Key partners: TDA-ARC; TDA-Forestry; UT-WRRC; APSU; TNRC&D; MSFF; TVA; WCS; TDEC-WPC; MTSU; TWRA; UTIA; TFB; TCL; Citizens
Year(s): 2001-2005
- **Action 2:** Increase EWG membership by one member each year.
Lead: TDA-NPS Program
Key partners: EWG
Year(s): 2001-2005
- **Action 3:** Establish the EWG mission statement, a list of collective capabilities, and priorities for funding.
Lead Agencies: EWG and TDA-NPS Program
Year(s): 2001-2005
- **Action 4:** Annually review, as necessary, the programs of federal agency partners for consistency with 319 priorities.
Lead: TDA-NPS Program
Key Partners: All federal agency partners
Year(s): 2001-2005

Long Term Goal 2.

Fully implement all developed TMDLs for nonpoint sources in compliance with existing regulations, policies, or agreements by 2015.

This goal does not apply to this chapter.

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

This goal does not apply to this chapter.

Long Term Goal 4.

Beginning in 2006, through regulatory and non-regulatory means, prevent previously unlisted waters from being included on the 303(d) List because of nonpoint source impairments.

This goal does not apply to this chapter.



Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution, and how to prevent it.

- **Action 1:** Continue to sponsor the Tennessee Nonpoint Source Partnership Conference annually.
Lead: TDA-NPS Program
Key partners: TDA-Forestry; TDEC-WPC; UT-WWRC; TNRC&D; TCL; UTIA; TNC; USDA-NRCS
Year(s): 2001-2005
- **Action 2:** Attend, at a minimum, five events annually, such as Earth Day activities, water festivals, No-Till Field Day to disseminate information to the public through educational displays, publications and direct communication.
Lead: TDA-NPS Program
Year(s): 2001-2005
- **Action 3:** Create and distribute two new publications annually, such as educational pamphlets, posters, manuals, videos, CD ROMs.
Lead: TDA-NPS Program
Key Partners: EWG
Year(s): 2001
- **Action 4:** Expand TDA-NPS Program web page and update continually, as needed. Include links to all working group member agencies.
Lead: TDA-NPS Program
Key Partners: EWG
Year(s): 2001-2005
- **Action 5:** Provide at least three press releases to the media concerning the TDA-NPS Program activities annually.
Lead: TDA-NPS Program
Year(s): 2001-2005
- **Action 6:** Conduct at least one Ag In the Classroom workshop annually.
Lead: TFB
Year(s): 2001-2005
- **Action 7:** Develop three additional outdoor classrooms annually.
Lead: MTSU, TDA-NPS Program
Key partners: public and private schools
Year(s): 2001-2005
- **Action 8:** Sponsor nine regional and one state Envirothon annually.
Lead: TDA-NPS Program, TN-RC&Ds
Year(s): 2001-2005

1.8 EDUCATION & PUBLIC AWARENESS



- **Action 9:** Begin one new in-stream education activity each year.
Lead: TDA-NPS Program
Key Partners: APSU, MSFF, IWL, high schools and universities; conservation groups; TN-AQ
Year(s): 2001-2005
- **Action 10:** Make the Instream Education manual available to citizens statewide.
Lead: TDA-NPS Program
Year(s): 2001
- **Action 11:** Expand the adopt-a-watershed program for student groups by one watershed annually.
Lead: TN-AQ; TDA-NPS Program
Year(s): 2001-2005
- **Action 12:** Fund, at a minimum five nonpoint source pollution demonstration projects annually.
Lead: TDA-NPS Program
Year(s): 2001-2005
- **Action 13:** Develop Memoranda of Agreement with key federal agencies to improve programmatic consistency.
Lead: TDA-NPS Program
Key Partners: All federal agency partners
Year(s): 2001-2005

Long Term Goal 6.

Through the process of continuous improvement, routinely assess all programmatic functions of the TDA-NPS Program in order to maximize efficiency, decrease the bureaucratic burden and increase the numbers of participants in the program.

- **Action 1:** Request feedback from partners annually to assess the quality of the TDA-NPS Program
Lead: TDA-NPS Program
Key Partners: EWG
Year(s): 2001-2005

Long Term Goal 7

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

See chapter 1.9 for action items related to water quality monitoring and assessment.

1.9 WATER QUALITY MONITORING: STATEWIDE & WATERSHEDWIDE



INTRODUCTION



This chapter conveys the local, state, and federal agency, and organization commitment to monitoring the quality of the state's waters. The following are the primary approaches the TDA-NPS Program and its partners will use to accomplish this:

1. Continue to satisfy sections 106, 319(h), 303(d) and 305(b) of the Clean Water Act (CWA) and Tennessee Water Quality Control Act by assessing the quality of the waters of the state and determining water bodies that are and are not fully supporting their designated uses.
2. Continue to monitor water quality to determine trends.
3. Continue to support instream education efforts across the state.
4. Continue to investigate and refine new methodology for cost effective monitoring.
5. Continue to monitor the waters of the state to determine BMP effectiveness.

DESCRIPTION

Recently, water quality monitoring in Tennessee has undergone tremendous changes, especially the efforts of the Tennessee Department of Environment and Conservation, Division of Water Pollution Control (TDEC-WPC) and The Department of Health, Aquatic Biology Section. TDEC's routine statewide water quality assessment monitoring has adopted a five-year cycle watershed-based intensive sampling schedule. The methodology of benthic sampling has changed also. With the help of an EPA grant, the Biorecon method was developed to enable a quick screening of a large number of sites. Additionally, fluvial geomorphology techniques have been added to acquire additional information on the dynamics of sedimentation and erosion of impacted streams. Also, standards for water quality are currently being modified to express ecoregion differences across the state. There are now several groups in Tennessee that are sampling waters of the state in various degrees; ranging from monthly sampling to site specific benthic surveys.

EXTENT OF PROBLEM AND SOLUTIONS

There are three challenges facing the water quality monitoring programs for the state of Tennessee:

1. A need for more information
2. Increase coordination among water quality monitoring agencies and the public
3. More focused data collection, sharing and utilization

Encouraging the public to become good stewards of their environment is good for protecting water quality and is one of the fundamental methods of solving our nonpoint

1.9 WATER QUALITY MONITORING: STATEWIDE & WATERSHEDWIDE



source problems. An informed public is essential. One method of accomplishing this is involving them in water quality monitoring.

The TDA-NPS program has allocated funds toward water quality assessment across the state. The more resources the state can direct towards monitoring, the better we can determine the quality of our waters and also the better we can assess progress restoring impaired waters. Better agency coordination between those monitoring water quality is an important goal. Also, a better mechanism of data sharing is key to the success of these efforts. Sharing, storing, retrieving and accessing data are critical and should become standardized among organizations.

COOPERATING PARTNERS

Partners

Citizens Groups

Tennessee Department of Environment and Conservation-Division
of Water Pollution Control

Tennessee Department of Health, Aquatic Biology Section

Tennessee Valley Authority

Tennessee Wildlife Resources Agency

U.S. Army Corps of Engineers

U.S. Fish and Wildlife Service

U.S. Geological Survey

USDI - National Park Service

Big South Fork of The Cumberland River

Great Smoky Mountains National Park

Abbreviation

TDEC-WPC

TDH

TVA

TWRA

USACOE

USF&WS

USGS

USDI-NPS

BSF

GSMNP

Citizens/ Multi-Agency Groups

There are several groups across Tennessee that conduct monitoring:

- **Boone Watershed Partnership** has quarterly lake cleanups, local high schools doing volunteer monitoring and an Adopt-A-Watershed effort with assistance from TVA and East Tennessee State University.
- **Hiwassee Interagency Team (HIT)** is a multi-agency, tri-state effort that has completed several water quality assessments and monitoring studies.
- **Sequatchie River Interagency Team (SRIT)** is a multi-agency effort that conducted a fish sampling Index of Biotic Integrity (IBI) in 1999 in the Sequatchie watershed to determine the health of the waters compared to an IBI done in 1970.
- **Mid-South Fly Fishers** have funded the water quality monitoring in at least three schools in West Tennessee.

Several schools in Tennessee have integrated water quality monitoring into their activities. For example, 12 schools (middle and high schools) in east Tennessee have put in place an Adopt-A-Watershed curriculum with the assistance of the Knoxville Water Quality Forum. Eight more schools are planned for the future.

1.9 WATER QUALITY MONITORING: STATEWIDE & WATERSHEDWIDE



Tennessee Department of Environment and Conservation – Water Pollution Control (TDEC-WPC)

The function of the Division of Water Pollution Control's water quality monitoring program is to provide a measure of Tennessee's progress towards meeting the goals established in the federal Clean Water Act and the Tennessee Water Quality Control Act.

To accomplish this task, data are collected and interpreted in order to:

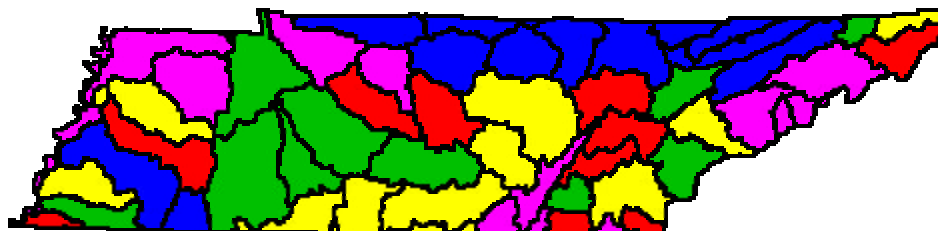
1. Identify problem areas where instream pollutants violate Tennessee numerical or narrative Water Quality Standards, thereby assessing the degree of impairment of designated uses.
2. Document areas with potential human health threats from fish tissue contamination or elevated bacteria levels.
3. Establish trends in water quality.
4. Gauge compliance with NPDES permit limits.
5. Document baseline conditions at reference sites.
6. Measure water quality improvements based on site remediation.
7. Identify proper stream-use classification, including Anti-degradation Statement implementation.
8. Document water quality changes in the eleven Unified Watershed Assessment (UWA) watersheds.

It is the responsibility of the TDEC-WPC to secure, protect, and preserve the right of Tennessee's citizens to unpolluted waters. TDEC-WPC has begun to synchronize the issuance of discharge permits on a watershed basis. The monitoring schedule now coincides with the watershed cycle. In addition to synchronizing permits, the Division will use the Watershed Management Approach to improve coordination with other organizations involved with protecting water resources, and to encourage public participation.

The state has 54 watersheds corresponding to the 8-digit USGS Hydrologic Unit Code (HUC). These watersheds are combined in five groups for monitoring, on a rotating five year cycle, according to year of implementation.

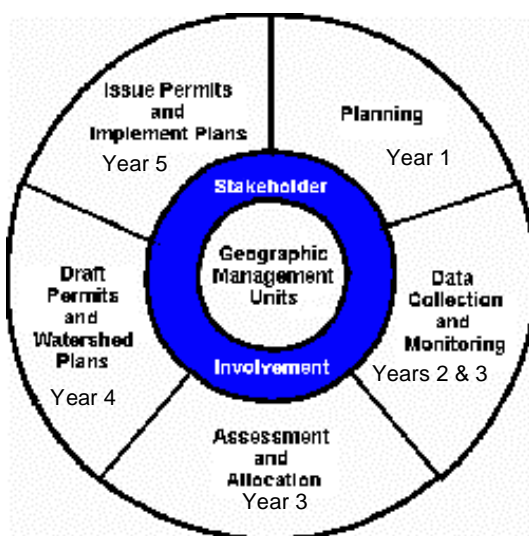
The watershed management approach was initiated in the first group of watersheds in 1996. Additional groups will be initiated in each subsequent year.

1.9 WATER QUALITY MONITORING: STATEWIDE & WATERSHEDWIDE



	West Tennessee	Middle Tennessee	East Tennessee
Group 1	<ul style="list-style-type: none"> • Nonconnah • South Fork of the Forked Deer 	<ul style="list-style-type: none"> • Stones • Harpeth 	<ul style="list-style-type: none"> • Tennessee (in Meigs & Rhea Counties) • Watts Bar • Ocoee • Emory • Watauga
Group 2	<ul style="list-style-type: none"> • Loosahatchie • North Fork Forked Deer • Forked Deer 	<ul style="list-style-type: none"> • Collins • Caney Fork • Wheeler Lake • Upper Elk • Lower Elk • Pickwick Lake 	<ul style="list-style-type: none"> • Hiwassee • Fort Loudoun / Little • South Fork Holston
Group 3	<ul style="list-style-type: none"> • Wolf • Tennessee Western Valley (Beech) • Tennessee Western Valley (KY Lake) 	<ul style="list-style-type: none"> • Upper Duck • Lower Duck • Buffalo 	<ul style="list-style-type: none"> • Tennessee (Hamilton Co. w/o Chattanooga) • Little Tennessee • Lower Clinch • North Fork Holston
Group 4	<ul style="list-style-type: none"> • Lower Hatchie • Upper Hatchie 	<ul style="list-style-type: none"> • Red • Barren • Cumberland (Old Hickory Lake) • Upper Cumberland (Cumberland Lake) • Upper Cumberland (Cordell Hull) • Obey 	<ul style="list-style-type: none"> • South Fork Cumberland • Upper Cumberland • Powell • Upper Clinch • Holston • Tennessee (Chattanooga Area)
Group 5	<ul style="list-style-type: none"> • Mississippi • North Fork Obion • South Fork Obion 	<ul style="list-style-type: none"> • Lower Cumberland (Lake Barkley) • Lower Cumberland • Gunter'sville Lake 	<ul style="list-style-type: none"> • Tennessee (Marion County) • Sequatchie • Conasauga • Upper French • Lower French • Pigeon • Nolichucky

1.9 WATER QUALITY MONITORING: STATEWIDE & WATERSHEDWIDE



The watershed management approach uses a 5-year cycle. Tennessee's cycle begins with planning and data collection in the first year. Monitoring, assessment, wasteload allocation, and permit issuance occur in the following years.

Although three public meetings are scheduled in years one, three and five of the five year cycle, public participation is scheduled and encouraged throughout the cycle.

Each year the planning phase for one of the five groups begins. Division's activities in each group will be sequenced into a 5-year cycle that coincides with the duration of discharge permits. Monitoring will take place in the second year, and occasionally in the third year, of each cycle.

In January 1999, TDEC initiated a 4-year Strategic Plan. The strategy states that the Department will protect, preserve and improve the quality of Tennessee's air, land and water.

The following action items are listed in the plan:

- Complete the assessment and prioritization of 32 watersheds under the Department's water quality management plan by January 1, 2003.
- Reduce by 25 percent the number of impaired stream miles listed on the 1998 303(d) list by January 1, 2003.
- By January 1, 2003, develop control strategies, in conjunction with state and federal partners, on 100 streams that are listed on the 303(d) list of stream that are not achieving compliance with at least one use classification.
- Achieve no net loss of wetlands over the next four years.
- Monitor water quality of rivers, lakes, wetlands, and ground water and report annually on improvements in water quality conditions throughout the state.

Tennessee Department of Health (TDH)

Current Projects

1. **Probabilistic monitoring** of 50 sites randomly selected in ecological subregion 71i (Inner Nashville Basin). Jan 2000 - December 2000. Benthic organisms collected (semi-quantitative) spring and fall, chemicals collected quarterly.
2. **TMDL on Davis Creek**, Claiborne County. Nine stations. Benthic organisms collected once, in fall. (Biorecon). Chemicals collected monthly. Jan 2000 - Dec 2001.
3. Assisting TDEC-WPC in Group III watershed chemical collections. Bacteria at 32 stations monthly. Chemical collections at 18 stations, quarterly. Dec 99 - November 2000.
4. **Biorecons and chemical collections** at 20 stations in Hardin Co. - June 2000.
5. **Biorecons** at 10 sites in the Big Sandy Watershed - October 2000.

1.9 WATER QUALITY MONITORING: STATEWIDE & WATERSHEDWIDE



6. **Biorecons** 13 for Memphis Environmental Assistance Center - June 2000.
7. **Nolichucky Watershed Survey-UWA project** (Biorecons all tribs, semi-quantitative and chemicals at 303(d) listed sites) July-October 2000.
8. **Little River Watershed** (Biorecons all tribs, semi-quantitative and chemicals at 303(d) listed sites) Oct-Nov 2000.

Tennessee Valley Authority (TVA)

TVA has an extensive history in sampling streams and reservoirs in the Tennessee River watersheds. Their methodology is as follows:

Reservoir sampling for ecological health in 31 reservoirs: 1 – 4 site per reservoir every other year	Nutrients, DO, pH, etc. - monthly *Benthic: annually, Fish community: annually Sediment quality: annually Fish tissue: every 2 – 4 years
Public Recreation Areas - Bacteria Sampling	200+ sites on reservoirs and streams
Stream Sampling: Fixed Stations on 18 major tributaries of the Tennessee River	Fish IBI: annually Benthic: annually Fish community: annually Nutrients, D.O., pH, etc. - quarterly
Ambient Sampling: 900 sites are sampled on rotational system (150 – 180 per year)	Fish IBI & Benthic assessment annually on a five year cycle

*Benthic – macroinvertebrates

Tennessee Wildlife Resources Agency (TWRA)

TWRA samples approximately 75 sites annually. At the sites they sample for fish IBI, pH, temperature, conductivity, dissolved oxygen, and rapid habitat assessment. Watershed evaluation, fish community, and benthic assessments are performed on approximately one third of the sites.

US ARMY CORPS OF ENGINEERS (USCOE), NASHVILLE DISTRICT General Sampling Plan for Years 2000-2004

Lake Barkley

Total of **nine** sites in Tennessee. (7 Lake sites, 2 Stream sites)

Sampling trips per year = 2

In Year 2002 they will collect samples for contaminants at 3 sites. See below for details.

Cheatham

Total of **16** sites. (11 Lake sites, 5 Stream sites)

Sampling trips per year = 2

In Year 2004 they will collect samples for contaminants at 10 sites. See below for details.

1.9 WATER QUALITY MONITORING: STATEWIDE & WATERSHEDWIDE



Old Hickory

Total of **15** sites. (9 Lake sites, 6 Stream sites)

Sampling trips per year = 2, **except in 2001 when 5 trips will be made (Intensive Level).**

In Year 2001 they will collect samples for contaminants at 5 sites. See below for details.

Cordell Hull

Total of **16** sites. (11 Lake sites, 5 Stream sites)

Sampling trips per year = 2.

In Year 2000 they will collect samples for contaminants at 5 sites. See below for details.

J. Percy Priest

Total of **17** sites. (11 Lake sites, 6 Stream sites)

Sampling trips per year = 2, **except in 2004 when 5 trips will be made (Intensive Level).**

In Year 2004 they will collect contaminants at 8 sites. See below for details.

Center Hill

Total of **19** sites. (11 Lake sites, 8 Stream sites)

Sampling trips per year = 2.

In Year 2001 they will collect contaminants at 5 sites. See below for details.

Dale Hollow

Total of **16** sites. (9 Lake sites, 7 Stream sites)

Sampling trips per year = 2, **except in 2000 when 5 trips will be made (Intensive Level).**

In Year 2000 they will collect contaminants at 6 sites. See below for details.

Parameters

- In Situ: Temperature, Dissolved Oxygen, pH, Specific Conductance, Secchi Disk Transparency, Alkalinity
- Metals: Aluminum, Calcium, Iron, Magnesium, Manganese, Potassium, Sodium, Zinc
- Nutrients: Nitrate/Nitrite, Ammonia Nitrogen, Kjeldahl Nitrogen, Phosphorus Total & Dissolved
- Total Organic Carbon, Hardness, Sulfates, and Chlorophyll a
- Solids: Total Solids, Suspended Solids, Dissolved Solids, Total Volatile Solids, Suspended Volatile Solids, Dissolved Volatile Solids
- Algae: Phytoplankton Species identifications, densities, trophic state, diversity
- Benthic Macroinvertebrates: Species identifications, densities, and various other metrics/indices are calculated
- Sediment Contaminants: Priority Pollutant Metals, Pesticides, PCB's, Volatile Organics, Semi-volatile organics

Sampling Frequency:

- Routine: Two per project per year
- Intensive: Five trips per project per year

1.9 WATER QUALITY MONITORING: STATEWIDE & WATERSHEDWIDE



US Fish and Wildlife Service (USF&WS)

The USF&WS samples seven wildlife refuges in Tennessee, at a frequency of two to five sites per refuge every two years. The parameters are:

- fish
- macroinvertebrates
- water quality
- sediment

USF&WS is the principal Federal agency responsible for conserving, protecting, and enhancing fish, wildlife, and plants and their habitats for the continuing benefit of the American people. These goals are accomplished through Federal programs relating to migratory birds, threatened and endangered species, certain marine mammals, inland sport fisheries, specific fishery and wildlife research activities, and management of the National Wildlife Refuge System and National Fish Hatchery System.

Programs implemented by the Tennessee/Kentucky Field Office are concentrated in the areas of endangered species recovery, habitat restoration on public and private lands, contaminant assessments, rare species surveys and monitoring, wetland and other habitat characterizations, and evaluations of the effects of proposed water and land development projects, including surface and underground mining, on fish and wildlife resources and habitats.

Contaminant investigations, which have been conducted in the Tennessee River, Cumberland River, and Mississippi River watersheds, include:

Tennessee River Watershed		
Tennessee NWR	Tennessee and Big Sandy Rivers	Houston Co., TN
	Tennessee River	Hardin Co., TN
Cumberland River Watershed		
Cross Creeks NWR	Cumberland River	Stewart Co., TN
Bear Creek (BSF)	Bear Creek	Scott Co., TN
Mississippi River BEST	Cumberland River	Montgomery Co., TN
Mississippi River Watershed		
Reelfoot NWR	Reelfoot Lake/Lake Isom	Obion Co., TN
	Mississippi River	Shelby Co., TN
Chickasaw NWR	Mississippi River	Lauderdale Co., TN
Mississippi River Alluvial Plain	Mississippi River	West Tennessee
Lower Hatchie NWR	Hatchie River	Tipton Co., TN
Hatchie NWR	Hatchie River	Haywood Co., TN

Statutory authority for Service-related assessment activities is primarily provided through the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.). Funding mechanisms operate on a one-year cycle from October 1 to September 30. Funding for a wide variety of monitoring and enhancement activities is also provided to the TWRA through Section 6 of the Endangered Species Act.

1.9 WATER QUALITY MONITORING: STATEWIDE & WATERSHEDWIDE



USDI – National Park Service

Big South Fork National River and Recreation Area (BISO)

Personnel in the park service monitor water quality at five sites in the BISO and at five sites in the Obed Wild and Scenic River four times a year. In the past, they were monitoring 30 sites at each park. They monitor the following parameters: Dissolved Oxygen, temperature, pH, alkalinity, acidity, chloride, iron, sulfate, manganese, fecal streptococci and coliform. They are in the process of re-evaluating the parameters and sites.

Great Smoky Mountains National Park (GSMNP)

Personnel in the park service sample 90 sites quarterly for fish IBIs, pH, conductivity, chloride, nitrate, sulfate, sodium, ammonium, potassium, magnesium, calcium, silica, and total aluminum (for selected sites). The University of Tennessee is currently analyzing the data and will make recommendations for any future changes in the sites and frequency of sampling.

US Geological Survey (USGS)

USGS maintains stream gages across Tennessee. Additionally, they perform water quality sampling to support special projects.

Sampling Type	Sites
Stream Flow discharge	61 stream sites
Stage lake sampling	32 sites
Water well sampling	21 wells sites
Regular basic sampling	8 stream sites
Irregular sampling	30 sites one or two times a year
Monthly stream sampling	5 sites

USGS also conducts special study units called the National Water Quality Assessment Program, NAWQA. In Tennessee, there are three being conducted: The Lower Tennessee River Basin Study, the Upper Tennessee River Basin Study Unit, and the Mississippi Embayment. Study planning and design, and analysis of existing data, will be done during the first 2 years. After the 2-year planning period, surface and groundwater and ecological data will be collected intensively for 3 years during a high-intensity phase. A lower intensity phase follows for the next 6 years during which water quality is monitored at a selected number of sites and areas assessed during the high-intensity phase. Alternating high- and low-intensity monitoring phases allows the NAWQA Program to examine trends in water quality over time in a cost-effective manner, eventually assessing about two-thirds of the Nation's water resources. During the high-intensity phase, new chemical, physical, and ecological data will be collected from selected areas at local and regional scales to describe the quality of water throughout the study unit. These data will be used to determine the water chemistry of streams and aquifers; the quantity and quality of suspended sediment and bottom sediments in streams; the variety and number of fish, benthic invertebrates, and algae in streams; and the presence of contaminants in fish tissues. Individual streams, aquifers, and biological species representative of the most important water resources and water-quality concerns in the study unit and the Nation are selected for sampling and analysis.

1.9 WATER QUALITY MONITORING: STATEWIDE & WATERSHEDWIDE



A series of technical and nontechnical reports describing the results of high- and low-intensity-phase data collection and analysis are planned.

OTHER FUNDING SOURCES

Additional funding sources for environmental projects are listed in the Catalog of Federal Funding, which can be found at: www.aspe.os.dhhs.gov/cfda

CURRENT 319 PROJECTS

TDA-NPS has funded monitoring in specific watersheds and projects since its inception. In FY-97, we began funding TDEC's Watershed Based Monitoring program across the state and in FY-99 we began a focused effort of documenting water quality change in the 11 UWA watersheds.

Instream Education

The TDA-NPS program is developing an Instream Education Manual to aid local groups in setting up water quality sampling/education programs. The manual will give specific information on how to conduct an instream education program.

TDEC WPC

Statewide Watershed Monitoring

In 1996, TDEC began a watershed initiative for water quality management. This watershed approach consists of five parts:

- 1) Planning and data collection
- 2) Monitoring
- 3) Assessment and allocation
- 4) Drafting watershed plans and
- 5) Implementation of watershed plans.

The watershed effort at the TDEC-WPC has been receiving TDA-NPS funding for water quality monitoring. In the future, we will continue to fund this activity.

The goals of this project are to improve water quality monitoring by applying a comprehensive approach to runoff pollution source identification and pollutant load analysis. This analysis of water quality, and the identification of areas impacted by nps pollution, will result in a more comprehensive water quality assessment and a more informed strategy for establishing future BMPs. Three strategies will be set to facilitate meeting this goal:

1. General qualitative assessment at the watershed level (BioRecon) will identify areas for further attention and assess the overall health of the watershed.
2. Conduct intensive chemical and biological (single habitat approach, formerly known as RBP3) monitoring at the subwatershed level to identify or quantify pollution sources or causes. Specific monitoring [single habitat approach (RBP3) and chemical analyses] at sites identified in BioRecon will provide more detailed information about the causes and sources of nps impacts and

1.9 WATER QUALITY MONITORING: STATEWIDE & WATERSHEDWIDE



3. Fluvial geomorphology (FGM) techniques will provide information about erosion and sediment of reference and impacted streams.

All selected sites will be mapped on GIS. Data, strategies, and watershed plans will be shared with cooperating organizations.

Following the schedule of Tennessee's watershed initiative, several approaches will be used to monitor water quality of impaired waters including:

- monitoring water quality before and after BMP implementation,
- monitoring water quality of streams in the vicinity of CAFO sites,
- focused monitoring in the second year of a two year monitoring strategy (a follow-up to first year monitoring designed to further characterize impacted water),
- special studies (monitoring at TDA-NPS-recommended sites),
- field correlation of macroinvertebrate populations and causes of impairment,
- collection of flow data for pollutant load calculation and verification,
- monitoring the physical stability of streams (determining bankfull discharges and cross-sectional areas and establishing regional curves),
- comparison of TDEC and NRCS habitat assessments, and
- monitoring baseline/reference stream conditions.

AUSTIN PEAY STATE UNIVERSITY (APSU)

Within the Red River/Sulphur Fork Creek 319(h) project, APSU, Center For Field Biology, is performing monitoring:

Two monitoring sites for each of the project's three subwatersheds are being sampled.

AREAS FOR PROGRAM EXPANSION

- Expand monitoring to determine if 303(d) listed waters have reached designated uses due to the efforts of 319(h) projects or partners.
- Continue to investigate more cost effective methods of water quality monitoring.
- Increase the number of partners to expand the amount of water quality monitoring done annually in Tennessee.
- All monitoring data collected in the state should be placed in STORET and/or made accessible on the Internet.

MEASURES OF SUCCESS

- Increase the number of stream miles reaching their designated uses and taken off the 303(d) list.
- Increase in the number of assessed stream miles.
- Increase in the amount of data entered in STORET by partners.

1.9 WATER QUALITY MONITORING: STATEWIDE & WATERSHEDWIDE



MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, to strengthen existing partnerships, and to foster greater trust, commitment and accountability.

- **Action 1:** The Water Quality Working Group (WQWG) will meet semi-annually.
Lead: TDA-NPS Program
Key partners: TDEC-WPC; TDH; TVA; TWRA; USCOE; USF&WS; USGS; USDI-NPS; BISO; GSMNP
Year(s): 2001-2005
- **Action 2:** Increase WQWG membership by one member each year.
Lead: TDA-NPS Program
Key partners: TDEC-WPC; TDH; TVA; TWRA; USCOE; USF&WS; USGS; USDI-NPS; BISO; GSMNP
Year(s): 2001-2005
- **Action 3:** Establish the WQWG mission statement, a list of collective capabilities, and priorities for funding.
Lead Agencies: WQWG and TDA-NPS Program
Key partners: TDEC-WPC; TDH; TVA; TWRA; USCOE; USF&WS; USGS; USDI-NPS; BISO; GSMNP
Year(s): 2001-2005
- **Action 4:** Develop Memoranda of Agreement with key federal agencies to improve programmatic consistency.
Lead: TDA-NPS Program
Key Partners: All federal agency partners
Year(s): 2001-2005

Long Term Goal 2.

Fully implement all developed TMDLs for nonpoint sources in compliance with existing regulations, policies, or agreements by 2015.

- **Action 1:** Coordinate water quality remediation efforts between TDEC-WPC and TDA-NPS Program with the development of Water Quality-related TMDLs, researching a unified approach in setting TMDL standards.
Lead: TDEC-WPC & TDA-NPS Program
Key partners: TDH; TVA; TWRA; USCOE; USF&WS; USGS; USDI-NPS; BISO; GSMNP
Year(s): 2001

1.9 WATER QUALITY MONITORING: STATEWIDE & WATERSHEDWIDE



- **Action 2:** Provide information concerning TMDL development to the WQWG, to gain their participation.
Leads: TDA-NPS Program, TDEC-WPC
Key Partners: WQWG
Year(s): 2001-2005
- **Action 3:** Provide necessary input to TDEC-WPC concerning nonpoint issues on 100% of waters selected for TMDL development.
Leads: TDA-NPS Program, TDEC-WPC
Key Partners: WQWG
Year(s): 2001-2005
- **Action 4:** Create an implementation plan for any TMDL developed by TDEC-WPC involving pollutants originating from Water Quality nonpoint sources.
Leads: TDA-NPS Program, TDEC-WPC
Key Partners: WQWG
Year(s): 2001-2005

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

Action items for Water Quality Monitoring are listed under Long Term Goal 7.

Long Term Goal 4.

Beginning in 2006, through regulatory and non-regulatory means, prevent previously unlisted waters from being included on the 303(d) List because of nonpoint source impairments.

Action items for Water Quality Monitoring are listed under Long Term Goal 7.

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution, and how to prevent it.

- **Action 1:** Develop and distribute educational material concerning Water Quality issues in increasing amounts each year.
Lead: TDA-NPS Program
Key partners:
Year(s): 2001-2005
- **Action 2:** Through 319 demonstration projects across the state, encourage local entities to create projects to remediate improper Water Quality sites which are affecting local water quality.
Lead: TDA-NPS Program
Key partners:

1.9 WATER QUALITY MONITORING: STATEWIDE & WATERSHEDWIDE



Year(s): 2001-2005

- **Action 3:** Provide educational information concerning Water Quality on the TDA-NPS web page.

Lead: TDA-NPS

Year(s): 2001

Long Term Goal 6.

Through the process of continuous improvement, routinely assess all programmatic functions of the TDA-NPS Program in order to maximize efficiency, decrease the bureaucratic burden and increase the numbers of participants in the program.

- **Action 1:** Investigate other funding sources such as The Nature Conservancy, Brownfields Program, as well as EPA.
Lead: TDA-NPS Program
Key partners: The Nature Conservancy; US EPA
Year(s): 2001-2005
- **Action 2:** Provide responses to all project related inquiries from grantees within three business days of the request.
Lead: TDA-NPS Program
Year(s): 2001-2005
- **Action 3:** Work with grantees to achieve timely submittal of all progress reports 100% of the time.
Lead: TDA-NPS Program
Year(s): 2001-2005
- **Action 4:** Develop a Priority Ranking System for project review.
Lead: TDA-NPS Program
Year(s): 2001-2005
- **Action 5:** Request feedback from partners annually to assess the quality of the TDA-NPS Program
Lead: TDA-NPS Program
Year(s): 2001-2005

Long Term Goal 7

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

- **Action 1:** Continue the five-year watershed management approach for collecting water quality data.
Lead: TDEC-WPC
Year(s): 2001-2005

**1.9 WATER QUALITY MONITORING:
STATEWIDE & WATERSHEDWIDE**



- **Action 2:** Annually, develop at least nine watershed/water quality management plans.
Lead: TDEC-WPC
Key partners: TDH; TVA; TWRA; USCOE; USF&WS; USGS; USDI-NPS; BISO; GSMNP; TDA-NPS Program
Year(s): 2001-2005

INTRODUCTION



The purpose of this chapter is to summarize the local, state, and federal commitment to protect and improve the quality of ground water through identifying problems, prioritizing problems, increasing partnership participation, and developing interest in developing demonstration projects.

DESCRIPTION

According to the U.S. Geological Survey, ground water supplies 45% of the drinking water for Tennessee, while surface water supplies 55%. This means that at least two and a quarter million Tennesseans get their drinking water from below the surface. At least 30% of those people live in Memphis-Shelby County, while 20% of Tennesseans rely on private wells or springs for their drinking water. Ground water, its quantity as well as quality, is a very important issue to Tennesseans.

It is well known in Tennessee that surface and ground water are often one in the same resource. West Tennessee soils can be quite sandy and porous, allowing surface waters to migrate through them to the sand aquifer in a fairly short period of time, while the presence of karstic terrain (i.e. sinkholes and open fractures, please see Appendix G for more information) and extremely thin soils in middle and portions of east Tennessee permit even a more rapid migration of surface water into the subsurface. Any pollutants found on the surface, such as nutrients, pathogens, hydrocarbons, or toxics, can easily migrate into the subsurface and possibly to a nearby receiving stream in a short period of time.

To contend with any pollution that might occur between surface and ground water, the state regulatory agencies of TDA-Regulatory Services Division-Pesticide Management Program, TDEC-Division of Ground Water Protection, TDEC-Division of Water Supply-Wellhead Protection and Source Water Assessment Program, TDEC-Division of Geology-Oil & Gas Board, TDEC-Division of Underground Storage Tanks, and TDEC-Division of Solid Waste Management, have been given, through state law, the capabilities of implementing necessary enforcement actions. TDA-NPS Program is initiating partnerships with these agencies in order to generate projects that will address water quality concerns. Examples of these partnerships would be our role in reviewing both the state's Pesticide Management Program and Source Water Assessment Program, while funding several local and state efforts addressing ground water problems.

1.10 GROUND WATER



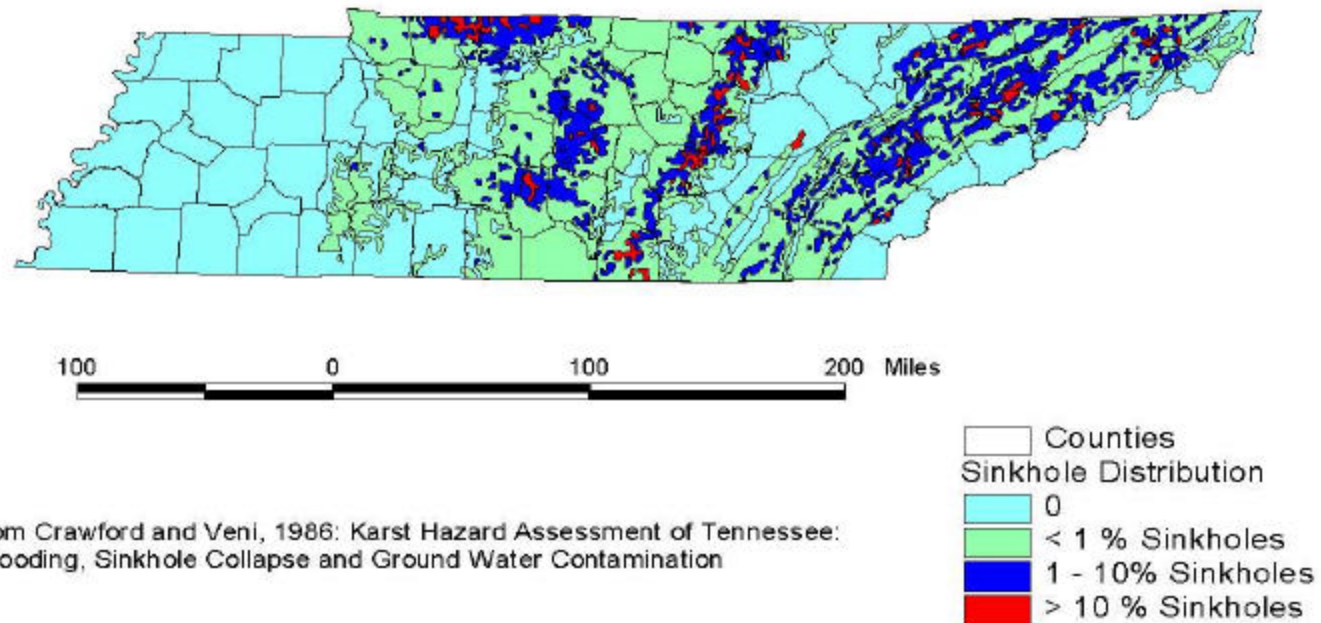
These efforts, in themselves, are insufficient to remediate Tennessee's ground water problems. Stronger partnerships supporting sound, productive water quality remediation and education projects, are the only means in which to address these issues in an effective manner. Through the establishment of the Ground Water Working Group (GWWG), intentional partnering efforts, and more involvement of partners in the project submission and selection process are the means to solve the existing problems.

EXTENT OF PROBLEM

In many locations throughout the state, aquifers are vulnerable to surface activities. There have been cases of highly volatile and dense organic compounds (chlorinated solvents and gasoline components) migrating through the subsurface materials to the aquifers, which serve public water systems. The problems were of such magnitude that the springs or wells were abandoned. Other pollutants such as bacteria and nutrients have also been found to contaminate local subsurface water supplies.

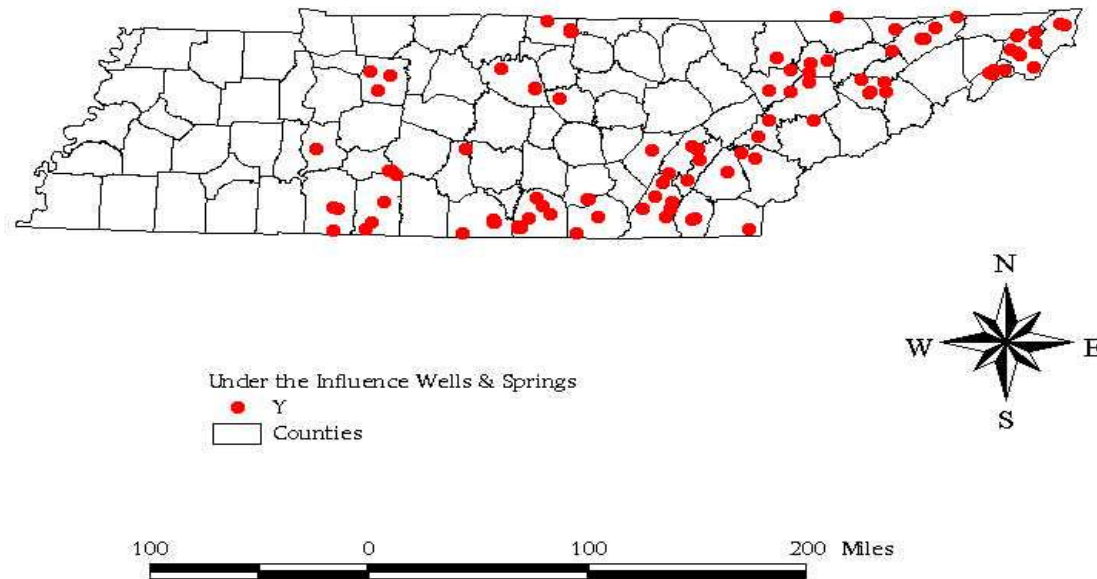
The following graphics demonstrate the statewide prevalence of groundwater pollution problems. Source of information: TDEC-DWS-GWMS.

Sinkhole Distribution in Tennessee

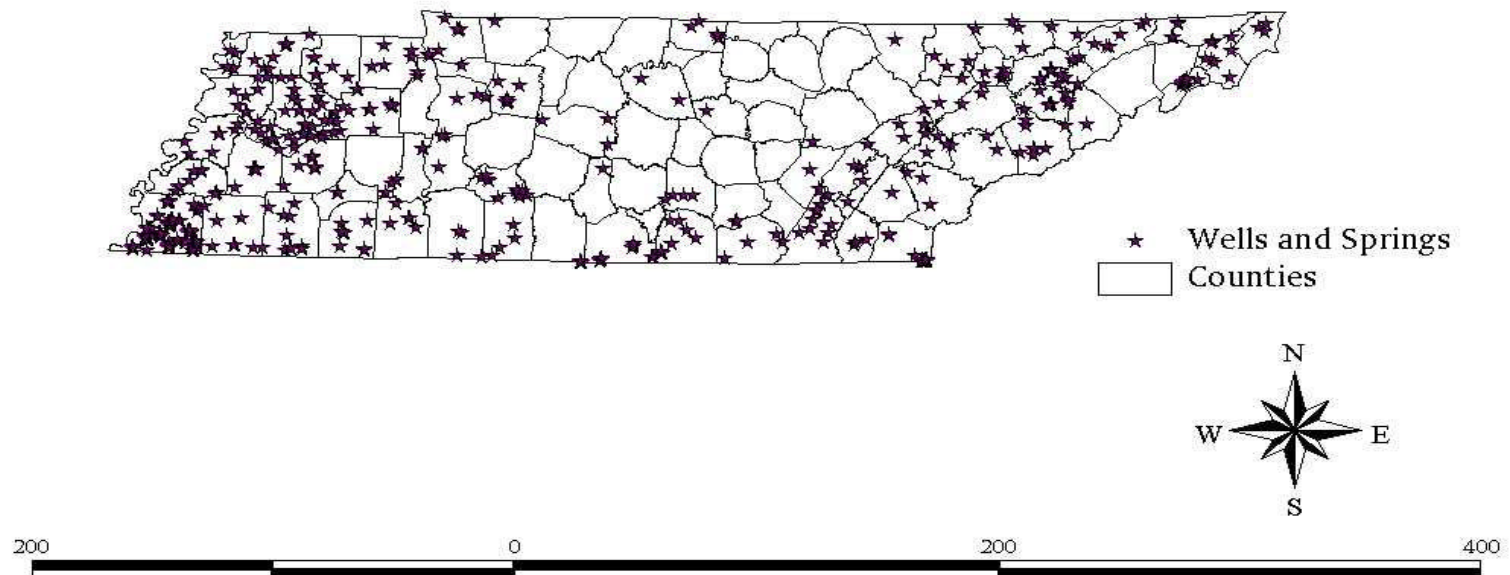


Adapted from Crawford and Veni, 1986: Karst Hazard Assessment of Tennessee:
Sinkhole Flooding, Sinkhole Collapse and Ground Water Contamination

Ground Water Systems Under the Influence



Community Public Water Systems Wells and Springs



1.10 GROUND WATER



There have been a few ground water monitoring studies completed in Tennessee during the past five to ten years. Two studies were completed in the Loosahatchie River in the southwestern portion of the state while three studies were completed in the Duck River in the south-central portion of the state. The Tennessee Department of Agriculture has completed a 6,809 sample, five year study of pesticide concentrations throughout the state.

Unfortunately, there is no ambient ground water quality monitoring in Tennessee. Private wells and springs are not monitored by any official entity, while public water systems are not required to test their raw water, just their finished water. The local homeowner is left with the responsibility of testing their own well or spring, which could be contaminated by a failing septic system or surface activity.

Additional resources are needed to better understand ground water quality and to initiate needed protection programs. The programs needed are:

- Ambient monitoring and ground water evaluations
- Assistance provided to small community water systems for ground water protection
- Monitoring and assessment of ground water contributing to ecologically vital waters
- Pollution prevention assistance to small businesses

Funding programs, such as 319, have no guidance from monitoring data to indicate what aquifers need remediation. TDA-NPS Program will continue to rely upon partnering efforts with other water quality agencies to address the problem of ground water pollution from both a focused watershed assessment, as well as a statewide public awareness approach.

Thus far, these public awareness programs have included the Pesticide Management Program and the Source Water Assessment Program (SWAP). Both of these programs generate information regarding sites of pollution in addition to being strong educational efforts. By remaining active in these programs, the TDA-NPS Program intends to make all Tennesseans more aware of the problems associated with the pollution of subsurface water supplies.

SOLUTIONS

Proper protection of sinkholes and wellheads:

- established and maintained grassed areas
- maintained throats (i.e. conduits between sinkhole and subsurface)

Established and maintained grassed set-backs for potential pollutants from:

- animal facilities
- septic systems
- machinery service areas
- applied chemicals (i.e. fertilizers and pesticides)

1.10 GROUND WATER



Properly installed septic systems:

- sand filters
- mounds
- artificial wetlands

Proper land management of areas in and around petroleum wellheads:

- properly installed catchment basins around oil wells and storage tanks

Proper land management and implementation of all needed BMPs in recharge areas of aquifers.

Proper storage, containment, mixing, and application of all pesticides and fertilizers.

Annual collection of unused home and farm pesticides and/or containers.

COOPERATING PARTNERS

Partners

Abbreviations

Austin Peay State University	APSU
Development Districts	
East Tennessee State University	ETSU
Local landowners	
Local watershed associations	
Tennessee Department of Agriculture	TDA
Ag Resources Conservation Program	-ARC
Regulatory Services Division	-RSD
Tennessee Department of Environment and Conservation	TDEC
Division of Community Assistance	-DCA
Division of Geology	-DG
Division of Ground Water Protection	-GWP
Division of Water Pollution Control	-WPC
Division of Water Supply	-DWS
Environmental Policy Office	-EPO
Tennessee Oil & Gas Board	TO&GB
Tennessee Technological University-The Water Center	TTU
US Department of Agriculture	NRCS
Natural Resources Conservation Service	
U.S. Geological Survey	USGS
University of Tennessee Institute of Agriculture	UTIA

Austin Peay State University (APSU)

The project manager at APSU is addressing ground water protection by implementing BMPs to reduce the sediment, bacterial, and pathogen loadings to the local sinkholes. This will be a demonstration program with the hopes that additional efforts are made by landowners with or without the funding of other sources. Because local streams are recharged by ground water, it is important

1.10 GROUND WATER



to the overall improvement of the water quality in the Red River watershed that these types of pollutant sources are eventually treated.

Development Districts

The Development Districts were established as Tennessee's regional planning and regional development organizations by Chapter 241 of the Public Acts of 1965. They include all of the state's counties and municipalities. Tennessee Code Annotated, Section 12-14-103 states the General Assembly's intent for the districts to be threefold:

- That the various counties and cities of the state be provided the most effective and efficient means of organizing themselves on a regional basis for the purpose of carrying on general and comprehensive planning and development activities such that would provide coordinated, efficient and orderly economic development of the state;
- That local governments through such regional agencies, be guided and assisted in making maximum use of federal, state and local programs designed to stimulate economic development and utilization of resources; and
- That the planning function of governments be separated from the plan implementation function, leaving to county, municipal and state governments the carrying out of all plans for physical, economic and resources development, as provided for under state laws.

ETSU-Department of Geological Sciences (ETSU)

The ETSU-Department of Geological Sciences is currently monitoring water wells and springs in an effort to learn more about subsurface water quality in northeast Tennessee. Presently, this information is not being used by the TDA-NPS Program, but will be used during future Watauga River watershed projects.

Local landowners

Local landowners that have either wells on their property or many sink holes, will be targets in public awareness campaigns.

Local watershed associations

Local watershed associations serve to make local landowners aware of the pollution potential to groundwater from improperly managed sinkholes and well heads.

Tennessee Department of Agriculture-Ag Resources Conservation Program (TDA-ARC)

Many of the BMPs funded by TDA-Ag Resources Conservation (TDA-ARC) program have direct effect on the quality of local ground water resources. Because of the interconnection between surface and ground water resources, TDA-Ag Resources Conservation Program will continue to implement BMPs in the state's many recharge areas to protect and improve ground water quality.

1.10 GROUND WATER



Tennessee Department of Agriculture-Regulatory Services Division (TDA-RSD) Pesticide Management Program

Proper pesticide storage and containment, pesticide collection, and regulatory efforts of TDA-RSD, through the state's Pesticide Management Program, continues to stop pollution of the ground water resources in Tennessee. These programs are supported by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Tennessee Insecticide, Fungicide, and Rodenticide Act (TIFRA) as well as the Tennessee Commercial Fertilizer Law (TCFL).

TDA-NPS Program will continue to financially support the pesticide collection efforts which is comprised of at least ten collection events across the state annually. The TDA-NPS Program will also continue to explore the possibilities of additional projects for remediative and educational activities. TDA-RSD has made progress towards enlisting cooperative efforts, in the form of model site demonstrations at agrichemical retailers, pest control and lawn service companies, golf courses, farms, and nurseries. The continuation of addressing pesticide problems at the rural, suburban, and urban levels is a priority for the TDA-NPS Program.

Tennessee Department Environment and Conservation-Division of Community Assistance (TDEC-DCA)

As the TDA-NPS Program demonstrates new BMPs across the state, it will be endorsing the use of the State Revolving Fund (SRF) Program, a financial assistance program managed by TDEC-Division of Community Assistance (TDEC-DCA). The TDA-NPS Program has had preliminary meetings with TDEC-DCA concerning the use of these funds in an effort to assist in the installation of BMPs across the state.

Tennessee Department of Environment and Conservation-Division of Geology (TDEC-DG)

The TN Oil & Gas Board is housed within TDEC-DG where it monitors the petroleum industry of Tennessee. This effort includes making certain that all wellheads are properly installed to prevent migration of any surface pollutants into subsurface water sources. Proper plugging of inactive or abandoned wells is also monitored and assured by this state agency.

Tennessee Department of Environment and Conservation-Division of Ground Water Protection (TDEC-GWP)

TDEC-GWP and seven contracted county health departments review the installation of all septic systems in Tennessee. By assuring that proper porosities exist in local soils through soil percolation tests and through periodic and final inspection of septic tanks and lines, TDEC-GWP prevents pathogens from reaching the ground water.

In many cases, especially in Middle Tennessee, access to ground water is protected by just a thin veneer of soil which restricts the installation of standard septic systems. The presence of shallow hardpans (shallow layers of impervious material) can also cause problems for subsurface drainage. TDEC-GWP has

1.10 GROUND WATER



the expertise of dealing with these issues on a daily basis, thereby making them ideal partners to assist the TDA-NPS Program in addressing related water quality issues.

Tennessee Department of Environment and Conservation-Division of Water Pollution Control (TDEC-WPC)

Even though TDEC-WPC is principally a surface water regulatory agency, they also have jurisdiction for the first seven inches of the soil/substrate as well as surface flow into sinkholes, open fractures, and direct conveyances to ground water aquifers. The TDA-NPS Program will of partner with TDEC-WPC on all applicable nonpoint source issue for the duration of 319 funding.

Tennessee Department of Environment and Conservation- Division of Water Supply (TDEC-DWS)

The Ground Water Management Section (GWMS) of this state agency protects and improves the ground water quality of Tennessee. It is imperative that these agencies continue to share information while developing and completing ground water remediation and education projects as partners.

TDA-NPS Program provided review of TDEC's Source Water Assessment Program (SWAP) document. Information gathered by the SWAP reconnaissance of watersheds will be useful in directing TDA-NPS Program remediation efforts for years to come. Another partnering effort occurs each year when the TDA-NPS Program, with the assistance of TDEC-WPC, TDEC-DWS-GWMS, and USDA-NRCS, determine the Unified Watershed Assessment (UWA) targeted watersheds. The presence of water intakes, whether they are surface or subsurface, are considered as a strong criteria for the selection of UWA watersheds.

TDEC-DWS is also responsible for the management of the state's Wellhead Protection Program. This effort attempts to limit the accessibility of surface pollutants to wellheads and aquifers used as water supplies.

TDEC-DWS is also responsible for the management of the Underground Injection Control Program, which regulates the introduction of pollutants into deep wells for disposal.

Tennessee Department of Environment and Conservation-Environmental Policy Office (TDEC-EPO)

The TDEC-EPO leads the state's Wetland Strategy effort. The Tennessee Wetlands Conservation Strategy completed in 1999. Although much of this effort addressed surface issues, it is known that wetlands do clean surface waters before they re-enter the subsurface in recharge areas as well as serving as points of surface discharge in association with springs. It is critical that wetlands are protected so they can continue to improve water quality.

Tennessee Technological University-The Water Center (TTU-WC)

1.10 GROUND WATER



The TTU-WC is currently under state contract to TDA to implement BMPs along Pigeon Roost Creek. This is a stream which flows underground for a substantial portion of its length and in so doing collects pollutants from residential and commercial portions of Cookeville.

Even though this project was introduced and will be managed by TTU-WC, the intention of the project is to demonstrate the need for such BMPs to the City of Cookeville and neighboring cities, thereby causing additional installations. Through this project the water quality of Pigeon Roost Creek could improve to the point of being removed from the 303(d) List.

US Department of Agriculture-Natural Resources Conservation Service (NRCS)

The local district conservationist (DC) uses EQIP and CRP funds, as well as funds from the TDA-ARC Fund channeled through the local SCD, to protect/restore springs and wetlands throughout the state. These DCs also implement many BMPs that have a direct effect on ground water quality by improving surface water quality before it percolates into the subsurface. Both of these efforts protect and improve ground water quality.

US Geological Survey (USGS)

All three offices of the USGS, Knoxville, Nashville, and Memphis, are actively involved in ground water monitoring. The Knoxville and Nashville offices are involved in the National Water Quality Assessment (NAWQA) program in the upper and lower Tennessee River watersheds. The USGS monitors ground water to determine how it interacts with local surface waters.

The USGS has also been involved in well water monitoring in the southwestern portion of the state, especially in the Loosahatchie River watershed. Data from this study as well as an equivalent study in the Upper Duck River watershed served as the bases for subsequent ground water monitoring completed by TDA-NPS Program. These types of studies point towards pollutant sources on the surface and assist in determining how surface water resources will be affected by these pollutants.

University of Tennessee Institute of Agriculture (UTIA)

UTIA is determining the ease of transport of pesticides and fertilizers to the ground water resources of West Tennessee. This 319 funded program is still in progress.

UTIA has also assisted with water quality monitoring of several ground water studies across the state. UTIA will likely participate in future monitoring projects and public awareness efforts.

Funding Opportunities

Additional funding sources for environmental projects are listed in the Catalog of Federal Funding, which can be found at: www.aspe.os.dhhs.gov/cfda



CURRENT 319 PROJECTS

Although much of the 319 emphasis has been placed on surface water issues, there has been significant concern for the ground water issues as well. Much of what is done on the surface affects the quality of ground water because of the conveyance between the two resources. This is true in Tennessee where the western division is comprised of highly porous soils with high conveyance into the subsurface, while the middle and eastern divisions are comprised of sinkholes, open fractures, and thin soils which promote a very high conveyance, in both directions, between the two water resources.

Even though the following listing addresses those 319 funded projects that have direct bearing on ground water quality, there have been several 319 funded watershed projects that have incorporated ground water issues within them. The following projects vary in what water quality aspects are addressed. Both the Duck and the Loosahatchie River projects were monitoring and assessments while the vadose zone project addressed the ease of transport of pesticides through the soil column under constant agricultural conditions. The remaining projects are demonstrations of a wide variety of nonpoint source categories that affect ground water quality. Many of the demonstration projects will be performed at least twice in each of the four major geomorphic provinces in Tennessee.

Grant Yr.	Project Title	Location
FY-93	Duck River-North Fork/Fall Cr. monitoring	Bedford County
FY-94	Loosahatchie River-Beaver Cr. monitoring	Shelby County
FY-96	Shallow Vadose Zone: Pest. & Fert. mon.	Henry County
FY-96	Alternative Septic: Wetland Treatment	McNairy County
FY-98	Pesticide Collection Program	statewide
FY-99	Pigeon Roost Cr. GW BMP Demo.	Cookeville
FY-99	Lambert Estates project	near Maryville
FY-00	Pesticide Collection Program	statewide
FY-01	STEP system with sand filter (proposed)	near Gatlinburg

AREAS FOR PROGRAM EXPANSION

- All Tennesseans need to be informed of the importance of clean ground water and its association with surface water quality.
- All county governments need to initiate local programs, which seek out failing septic systems and provide a means for the landowner to fix the problem.
- County governments, with the assistance of TDEC and TDA-NPS Program, need to initiate GIS systems to inventory failing septic systems and polluted water wells as a means of tracking needs and accomplishments.
- Statewide public awareness campaigns need to reach all owners of privately owned wells so they understand the need of wellhead protection.

1.10 GROUND WATER



- Statewide public awareness campaigns need to reach all owners of land with access points to the subsurface (sinkholes, open fractures, etc.), so that they will possess a full understanding of the surface pollutant-subsurface access principle.
- Statewide completion of the Source Water Assessment Program (SWAP), managed by TDEC-DWS, so that the entire state is GIS inventoried for remediation needs and these efforts need to be completed
- Statewide ground water monitoring needs to be developed to investigate aquifers, in a manner that is based on importance of the aquifer as a water supply.
- Statewide effort to protect ground water recharge and discharge areas through land acquisitions and permanent/temporary easements.

ENFORCEMENT MECHANISMS

Enforcement of ground water protection mechanisms are supported through several federal and state laws. Through the Tennessee Water Quality Control Act, TDEC-WPC and TDEC-DWS (Underground Injection Control Program only) protect ground water quality through enforcement of runoff to sinkholes, failing septic systems and underground injection of potentially harmful substances.

The state agency that enforces the proper use of pesticides is TDA-Regulatory Services Division-Pesticide Management Program. TDA-RSD has been assigned these responsibilities via FIFRA and TIFRA.

The plugging of wells and the proper installation of surface detention is regulated by the Tennessee Oil & Gas Board. TDEC-DG has staff who inspect these locations for compliance. Both surface and ground water resources are protected through these efforts.

Other potential pollutants of the ground water resources in Tennessee, including unprotected and polluted wellheads, leaking storage tanks, failing septic systems, among others are managed by the following state regulatory agencies:

- TDEC-Division of Ground Water Protection
- TDEC-Division of Water Supply
- TDEC-Division of Underground Storage Tanks
- TDEC-Division of Solid Waste Management

MEASURES OF SUCCESS

- The Source Water Assessment Program (SWAP), managed by TDEC-DWS, has been completed for the entire state GIS inventorying every site needing remediation

1.10 GROUND WATER



- All county governments have initiated locally operated programs, which seek out failing septic systems and provide a means for the landowner to install a remedative system
- All owners of privately owned wells have corrected any wellhead contamination issues
- All owners of land with access points to the subsurface (sinkholes, major fractures) have a full understanding of the surface pollutant-subsurface access principle and practice good stewardship towards protecting the local ground water resources
- Those owners of land which have been cited as needing remediation by the SWAP have completed these remedative efforts

MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, to strengthen existing partnerships, and to foster greater trust, commitment and accountability.

- **Action 1:** The Ground Water Working Group (GWWG) will meet semi-annually.
Lead: TDA-NPS Program
Key partners: TDEC; TDA-RSD; USGS; UTIA; Local governments; local watershed associations
Year(s): 2001-2005
- **Action 2:** Increase GWWG membership by one member each year.
Lead: TDA-NPS Program
Key partners: GWWG
Year(s): 2001-2005
- **Action 3:** Establish the GWWG mission statement, a list of collective capabilities, and priorities for funding.
Lead Agencies: URWG and TDA-NPS Program
Year(s): 2001-2005

1.10 GROUND WATER



- **Action 4:** Develop Memoranda of Agreement with key federal agencies to improve programmatic consistency.
Lead: TDA-NPS Program
Key Partners: All federal agency partners
Year(s): 2001-2005

Long Term Goal 2.

Fully implement all developed TMDLs for nonpoint sources in compliance with existing regulations, policies, or agreements by 2015.

Refer to Chapter 1.11, TMDL Implementation for specific action items related to this Long Term Goal.

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

This goal does not apply to this chapter.

Long Term Goal 4.

Beginning in 2006, through regulatory and non-regulatory means, prevent previously unlisted waters from being included on the 303(d) List because of nonpoint source impairments.

- **Action 1:** Provide funding to ground water related projects to abate and prevent pollution in waters not on the 303(d) List.
Lead: TDA-NPS Program
Key partners: GWWG
Year(s): 2001-2005

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution, and how to prevent it.

- **Action 1:** Develop and distribute educational material concerning Ground Water issues in increasing amounts each year.
Lead: TDA-NPS Program
Key partners: GWWG
Year(s): 2001-2005

1.10 GROUND WATER



- **Action 2:** Provide funding to ground water related demonstration projects annually.
Lead: TDA-NPS Program
Key partners: GWWG
Year(s): 2001-2005
- **Action 3:** Provide educational information concerning Ground Water on the TDA-NPS web page.
Lead: TDA-NPS
Year(s): 2001
- **Action 4:** Develop at least three demonstration projects focusing on importance of ground water quality protection.
Lead: TDA-NPS Program
Key Partners: GWWG
Year(s): 2001-2005

Long Term Goal 6.

Through the process of continuous improvement, routinely assess all programmatic functions of the TDA-NPS Program in order to maximize efficiency, decrease the bureaucratic burden and increase the numbers of participants in the program.

- **Action 1:** Investigate other funding sources such as The Nature Conservancy, Brownfields Program, as well as EPA.
Lead: TDA-NPS Program
Key partners: The Nature Conservancy; US EPA
Year(s): 2001-2005
- **Action 2:** Provide responses to all project related inquiries from grantees within three business days of the request.
Lead: TDA-NPS Program
Year(s): 2001-2005
- **Action 3:** Work with grantees to achieve timely submittal of all progress reports 100% of the time.
Lead: TDA-NPS Program
Year(s): 2001-2005
- **Action 4:** Develop a Priority Ranking System for project review.
Lead: TDA-NPS Program
Key Partner: GWWG
Year(s): 2001-2005

1.10 GROUND WATER



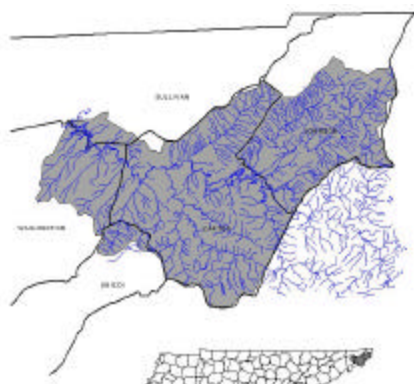
- **Action 5:** Request feedback from partners annually to assess the quality of the services provided by the TDA-NPS Program.
Lead: TDA-NPS Program
Year(s): 2001-2005

Long Term Goal 7.

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

- **Action 1:** Complete source water assessments for the protection of public water systems for both groundwater (wellhead protection plus susceptibility analysis) and surface water systems.
Lead: TDEC-DWS-GWMS
Year(s): 2003

INTRODUCTION



Section 303(d) of the Clean Water Act requires each state to list those waters within its boundaries that do not meet minimum water quality standards for designated use classifications. States are required to develop Total Maximum Daily Loads (TMDLs) for these waterbodies. The TMDL process establishes the maximum amount of a pollutant that a waterbody can assimilate without exceeding water quality standards and allocates a portion of this load to all contributing pollutant sources. The goal of the TMDL is the restoration of water quality of a stream or lake above minimum

acceptable levels through the reduction of pollutant loading.

The TDA-NPS Program, as the delegated state agency for the 319 grant program, has the responsibility to cooperate with TDEC-WPC and all other local, state and federal agencies to establish implementation strategies for the TMDLs developed by TDEC-WPC, for those waterbodies impaired by nonpoint source pollutants.

DESCRIPTION

A Total Maximum Daily Loading (TMDL) is a study that:

- 1.quantifies the amount of a pollutant in a stream,
- 2.identifies the sources of the pollutant,
- 3.and recommends regulatory or other actions that may need to be taken in order for the stream to no longer be polluted.

The following are actions that might be recommended:

Re-allocate limits on the sources of pollutants documented as impacting streams. It might be necessary to lower the amount of pollutants being discharged under NPDES permits or to require the installation of other control measures, if necessary, to insure that standards will be met. For sources the TDEC-WPC does not have regulatory authority over, such as ordinary agricultural and forestry activities, provide information and technical assistance to other state and federal agencies that work directly with these groups to install appropriate Best Management Practices (BMPs).

Even for the impacted streams found on the 303(d) List, TMDL development is not considered appropriate for all bodies of water. If enforcement has already been taken by TDEC-WPC and a compliance schedule has been developed; or if BMPs have already been installed for non-regulated activities, the TMDL is considered not applicable. In cases involving pollution sources in other states, the recommendation may be that another state or EPA perform the TMDL.

TMDL's can be described by the following equation:

1.11 TMDL IMPLEMENTATION

TMDL = sum of non point sources + sum of point sources + margin of safety

How are TMDLs Prioritized?

The 303(d) List was last updated in 1998. In the interim, the TDEC-WPC has restructured monitoring and permitting activities on a rotating watershed basis. In keeping with this approach, Tennessee has decided to develop TMDLs on a rotating watershed basis. Each watershed will be examined on a five-year cycle.

A typical cycle will generally include:

- Year 1: Hold planning meetings with "stakeholders". Stakeholders include citizens, environmental groups, other governmental agencies, municipalities, industries, and other interested parties. Develop a monitoring plan. •
- Year 2: Collect water quality data. •
- Year 3: Collect water quality data. •
- Year 4: Water quality assessment activities. Perform modeling and TMDL generation. •
- Year 5: Publish a watershed plan, which includes the proposed actions to be taken to insure that water quality standards will be met. Issue draft NPDES permits and hold public hearings.
- Year 6: Issue final permits after comments have been addressed. Begin cycle again in sixth year.

Tennessee's TMDL Program

•The draft 1998 303(d) list has been released and made available for public review. The 303(d) list is a compilation of the streams and lakes in Tennessee that are "water quality limited" and need additional pollution controls. Water quality limited streams are those that have one or more properties that violate water quality standards. Therefore, the stream or lake is considered to be impacted by pollution and is not fully meeting its designated uses.

Additionally, the 303(d) List prioritizes each of these water quality limited streams in regard to how quickly a TMDL should be performed on each.

The schedule for development is listed in the following table:

Watershed Group	Year	No. of High Priority TMDLs	Year	No. of Low Priority TMDLs
1	2000	14	2005	53
2	2001	20	2006	49
3	2002	12	2007	44
4	2003	7	2008	60
5	2004	17	2009	58

Statutory Requirements under Clean Water Act Section 303(d)

1.11 TMDL IMPLEMENTATION



States must, from time to time, develop lists of waters that do not meet State water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. States must establish priority rankings for waters on the lists based on severity of pollution and uses to be made of the waterbodies, such as fish and aquatic life, recreation, drinking water supply, irrigation, industrial water supply, navigation, and/or livestock watering and wildlife. States must develop TMDLs for waters on the lists. TMDLs specify the amount of a pollutant that needs to be reduced to meet State water quality standards and allocate pollution control needs among pollution sources in a watershed. EPA must approve or disapprove State lists and TMDLs within 30 days of final submission. EPA must establish lists of waters and TMDLs for states when EPA disapproves of the states' lists.

Implementing Regulations (40 CFR Section 130.7)

- Waters still needing TMDLs are those for which technology-based controls or other required pollution controls are not stringent enough to implement water quality standards.
- States must submit lists of waters needing TMDLs every two years (April 1 of even numbered years).
- States must target those waters for which TMDLs will be developed over the next two years.

The Five Steps of the TMDL Process

1. Identify Water Quality-Limited Waters
2. Prioritize Water Quality-Limited Waters
3. Develop the TMDL Plan
4. Implement Water Quality Improvement Actions
5. Assess Water Quality Improvement Actions

MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders to create new partnerships, strengthen existing partnerships, and to foster greater trust, commitment and accountability.

- **Action 1:** Collaborate annually with watershed partners to plan TMDL implementation strategies.
- Leads: TDEC-WPC and TDA-NPS Program
- Key Partners: USDA-NRCS; UTIA; TVA; TACD; TNRC&D
- Year(s): 2001-2005

1.11 TMDL IMPLEMENTATION



- **Action 2:** Develop Memoranda of Agreement with key federal agencies to improve programmatic consistency.
Lead: TDA-NPS Program
Key Partners: All federal agency partners
Year(s): 2001-2005

Long Term Goal 2.

Fully implement all developed TMDLs for nonpoint sources in compliance with existing regulations, policies, or agreements by 2015.

- **Action 1:** Develop a standard implementation protocol.
Leads: TDEC-WPC and TDA-NPS Program
Key Partners: USDA-NRCS; UTIA; TVA; TACD; TNRC&D
Year(s): 2001
- **Action 2:** Collect or update site specific land use information to target BMP implementation for 100% of developed TMDLs.
Leads: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; UTIA; TVA; TACD; TNRC&D
Years: 2001-2005
- **Action 3:** Create site specific implementation plans for 100% of the TMDLs developed.
Leads: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; UTIA; TVA; TACD; TNRC&D
Years: 2001-2005
- **Action 4:** Track the status of 100% of the implementation plans to determine program effectiveness.
Leads: TDA-NPS Program and TDEC-WPC
Key Partners: USDA-NRCS; UTIA; TVA; TACD; TNRC&D
Year(s): 2001-2005

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

The Goal does not apply to this chapter.

Long Term Goal 4.

Beginning in 2006, through regulatory and non-regulatory means, prevent previously unlisted waters from being included on the 303(d) List because of nonpoint source impairments.

The Goal does not apply to this chapter.



Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution.

- **Action 1:** Conduct at least eight Watershed Meetings annually.
Lead: TDEC-WPC
Key partners: TDA-NPS Program
Year(s): 2001-2005

Long Term Goal 6.

Through the process of continuous improvement, routinely assess all programmatic functions of the TDA-NPS Program in order to maximize efficiency, decrease the bureaucratic burden and increase the numbers of participants in the program.

The Goal does not apply to this chapter.

Long Term Goal 7

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

See Chapter 1.9 for action items related to water quality monitoring for the TDA-NPS Program.

NONPOINT SOURCE PROGRAM MANAGEMENT

There are programmatic responsibilities that are essential to the success of the TDA-NPS Program and the management of its grant projects. These responsibilities are partnership development, program and project management, and data management. The following sections describe how the TDA-NPS Program will fulfill these responsibilities.

PARTNERSHIP DEVELOPMENT

Because the 319 Program is a grant program, its success is dependent upon public and non-profit agencies and organizations entering into contracts to complete projects which help meet the established milestones of the program. The identification of all potential partners is of critical importance to the TDA-NPS Program.

The TDA-NPS Program relies on two types of partners to meet the milestones of the program. The most important of these is the general public. Without its consent, very few BMPs are ever implemented. Yet, the general public can not be convinced to participate in the implementation of BMPs without the outreach capabilities of agencies and organizations.

Staff members of these agencies and organizations provide the materials read by the landowner, operator, and citizen, while they possess the personal skills to relate to these individuals as they inform them of the necessities for action. These agencies and organizations also possess the capabilities of providing the design and implementation of the BMPs, the generation of educational materials, and the collection and analyses of water quality samples.

The TDA-NPS Program acquires these cooperating partners through several different methods, one of which is the Tennessee Nonpoint Source Partnership. This group is comprised of more than eight hundred citizens and professionals. This large group of individuals will meet annually at the TDA-NPS Program Partnership Conference to learn through presentations and discussions of relevant water quality issues. The partners have an opportunity to express what efforts need to be done, what they can do to accomplish these tasks, and what the TDA-NPS Program can do to assist. Water quality partnerships and projects will also be formed. The TDA-NPS Program intends to retain this annual event for the duration of 319 funding.

As components of this large group, there will be working groups for each of the following categories:

- Agriculture
- Silviculture
- Resource Extraction
- Land Disposal
- Water Quality Monitoring
- Ground water
- Urban Runoff
- Construction
- Hydrologic Modification
- Education

Regular meetings of these working groups will provide for exchange of information and ideas as well as encourage partnerships between agencies, organizations, and the general public. It is the intent of TDA-NPS Program to host these meetings semi-annually.

On occasion, the TDA-NPS Program will arrange meetings with specific agencies to promote partnerships. This has been done with TDEC-Division of Community Assistance in an effort to direct State Revolving Funds towards nonpoint source issues, and with the Tennessee Valley Authority as TDA-NPS Program staff met with members of its Watershed Management Teams.

Through partnerships, the TDA-NPS Program has the opportunity to fund statewide and watershed focused educational and BMP implementation projects. All BMP implementation projects will be required to incorporate public awareness components, where practical. Outreach projects, including videos, CD-ROMs, posters, and brochures, the TDA web site, outdoor classrooms, Instream Education, Water Education for Tennessee Teachers and others, will help establish more partners among Tennesseans. The TDA-NPS Program will also attend many watershed technical team meetings where local citizens and professionals meet to exchange information and ideas as well as establish nonpoint source projects.

Participation in partner meetings such as the Tennessee RC&D Council, Tennessee Association of Conservation Districts, Keep Tennessee Beautiful annual meetings, and TDEC watershed meetings will also provide the TDA-NPS Program opportunities to generate projects. Attendance and participation in professional meetings such as the Tennessee Water Resources Symposium, and the Kentucky-Tennessee Water Environment Association Annual Conference and will also help generate projects and partnerships.

MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, strengthen existing partnerships and to foster greater trust, commitment and accountability.

- **Action 1:** A revised NPS Program brochure will be generated and sent to every citizens group.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC, USDA-NRCS, TVA, UTIA, TNC, TNRC&D, SCDs, local governments
Year: 2005
- **Action 2:** Assist in the creation of one additional citizen-led watershed group annually
Lead: TDA-NPS Program
Key Partners: TDEC-WPC, USDA-NRCS, TVA, UTIA, TNC, TNRC&D, SCDs,

- Years: local governments
2001-2005
- **Action 3:** TDA-NPS Program staff will attend five statewide and regional organizational meetings annually, to build partnerships.
Lead: TDA-NPS Program
Key Partners: TDEC, USDA-NRCS, TVA, UTIA, TNC, TNRC&D, SCDs, local governments, citizen groups
Year: 2001-2005
 - **Action 4:** Sponsor the Tennessee Nonpoint Source Partnership Conference annually
Lead: TDA-NPS Program
Key Partners: TDEC, USDA-NRCS, TVA, UTIA, TNC, TNRC&D, SCDs, local governments, citizen groups
Years: 2001-2005
 - **Action 5:** Increase the attendance of potential partners at the Tennessee Nonpoint Source Partnership Conference annually
Lead: TDA-NPS Program
Key Partners: TDEC, USDA-NRCS, TVA, UTIA, TNC, TNRC&D, SCDs, local governments, citizen groups
Years: 2001-2005
 - **Action 6:** At each yearly partnership conference, present the status of the Tennessee Nonpoint Source Program with discussion of water quality success stories in the state along with how the program is accomplishing its management program goals.
Lead: TDA-NPS Program
Years: 2001-2005
 - **Action 7:** At each working group meeting, discuss the goals and action plans of each appropriate section of management program and revise as needed.
Lead: TDA-NPS Program
Years: 2001-2005
 - **Action 8:** Incorporate a feed back section on the NPS web site.
Lead: TDA-NPS Program
Years: 2001-2005

PROGRAM AND PROJECT MANAGEMENT

The TDA-NPS Program addresses nonpoint source water pollution from three aspects. These include education and public awareness, BMP implementation, and water quality monitoring. The following text briefly explains these aspects:

- Education and public awareness will be funded within the base grant.

- The grant pool project of the base grant will be funded annually in an effort to improve the water quality of small, agriculturally dominated watersheds, listed on the 1998 303(d) List.
- The Unified Watershed Assessment projects of the incremental grant will be funded in an effort to improve water quality of eight digit watersheds regardless of pollutant sources, in accordance with a Watershed Restoration Action Strategy, and approved by EPA.
- BMP implementation designed to demonstrate innovative technologies in geographic areas where these technologies are unknown, will be funded in the contractual portion of the base grant.
- Water quality monitoring will be funded in the contractual portion of the base grant as well as in the incremental grant.

Keeping the TDA-NPS Program provisions of the 1987 Reauthorization of the Clean Water Act in mind when promoting new directions among the cooperating partners is critical. The TDA-NPS Program must be certain that these provisions are being achieved while also making certain that it is not in conflict with existing programs, especially those regulatory in nature. This will require routine communication with EPA. There are several means to achieve this, which are:

- Being familiar with the annual EPA/NPS guidance
- Attending the regional program managers/coordinators meeting where these topics are discussed
- Attending periodic workshops and conferences that have a direct bearing on the success of the program

The TDA-NPS Program will send staff to these meetings on a regular basis.

Once a 319 proposal has been incorporated into an annual work plan and that grant has been awarded, the TDA-NPS Program will send the state contract to the grantee for signature. Once the grantee and the commissioner of TDA sign the contract and the proper processing has occurred, the state contract will be official. The grantee is then bound to the letter of the contract and work plan. Because the state contract is a tool used to ensure the completion of a grant agreement between the state of Tennessee and the United States government, the TDA-NPS Program will ensure that all work delineated in the original work plan is performed. The following listed below will be followed:

The contractor will be required to submit quarterly Expense and Progress Reports accompanied by invoices to indicate the amount of 319 funding they need to receive as reimbursement for services rendered. Contractors will be required to provide statements indicating how the actions of these expenditures satisfy their project milestones. Reimbursement requests will be reviewed to determine if costs submitted are allowable, and if the matching percentages are correct. Pertinent BMP information accompanying this material will be entered into the GIS database.

As the 319 and matching funds are spent, the TDA-NPS Program will track the remaining balance as well as submit milestone accomplishments to EPA via the national Grants Recording Tracking Systems (GRTS). The TDA-NPS Program

will submit to EPA an annual report detailing the accomplishments of the contracted projects and those of leading cooperating partners. Progress made by contractors will be reported on TDA's web site and in EPA's quarterly newsletter as success stories.

Once the project has ended, the contractor will be required, within 45 days of the completion date, to submit a final/closeout report. This report will summarize all that has been accomplished within the project/contract, how it benefited water quality, and what lessons have been learned. After this report is reviewed by TDA-NPS Program, it will be submitted to EPA along with the other project closeout reports included in that grant. Once the final/closeout report has been approved, the project is completed.

The state will submit semi-annual progress reports via GRTS, by April 30 and October 31 of each year and will submit annual report by September 1 of each fiscal year. When a grant has expired, the state will submit final closeout report within 90 days.

MILESTONES

Long Term Goal 6.

Through the process of continuous improvement, routinely assess all programmatic functions of the TDA-NPS Program in order to maximize efficiency, decrease the bureaucratic burden and increase the numbers of participants in the program.

- **Action 1:** Attend the Region 4 Nonpoint Source Coordinators Meeting annually.
Lead: TDA-NPS Program
Years: 2001-2005
- **Action 2:** Reduce the time between grant award and contract execution to 60 days, at a maximum.
Lead: TDA-NPS Program
Years: 2002
- **Action 3:** Develop a revised Request for Proposal Form, including comprehensive instructions, and make both available on the TDA web page.
Lead: TDA-NPS Program
Years: 2001
- **Action 4:** Develop an integrated database management system for the TDA-NPS Program, integrating GRTS and GIS, if feasible.
Lead: TDA-NPS Program, TDA-Information Systems
Years: 2001
- **Action 5:** Submit the Annual Report to EPA by October 1st, each year.
Lead: TDA-NPS Program

Years: 2001-2005

- **Action 6:** Submit semi-annual reports to EPA by April 30 and October 31 each year through GRTS.
Lead: TDA-NPS Program
Years: 2001-2005
- **Action 7:** Submit final closeout reports to EPA within 90 days of termination of a grant.
Lead: TDA-NPS Program
Years: 2001-2005
- **Action 8:** Submit the base and incremental workplans to EPA by July 1st annually.
Lead: TDA-NPS Program
Years: 2001-2005
- **Action 10:** Create and hold a workshop for potential nonpoint source project partners.
Lead: TDA-NPS Program
Years: 2002
- **Action 11:** Eliminate items of concern from the Annual and Mid-Year EPA Reviews for the TDA-NPS Program.
Lead: TDA-NPS Program
Years: 2002

GIS DATA MANAGEMENT

INTRODUCTION

Geographic Information System (GIS) is a tool used by the TDA-NPS Program for the tracking of water quality related efforts as well as the projection of needed efforts of this kind. The TDA-NPS Program has used GIS to a limited extent for the tracking of implemented BMPs as well as monitoring sites in priority watersheds where several funding agencies have been present.

The TDA-NPS Program GIS will be used for both storage and presentation of land use, BMP implementation, water quality, project, and new technology data/information. Because of the potential of GIS and its ability to produce useful coverage maps, the TDA-NPS Program plans to significantly increase the use of GIS.

The production of visual aids, including but not limited to maps, charts, graphs, etc., will provide an excellent means of tracking project progress and water quality improvements, while planning needed projects through land use delineation. Use of these tools will benefit the TDA-NPS Program and all cooperating partners, and will make all partnerships more efficient.

DESCRIPTION

The tracking of land use within a targeted watershed will provide the TDA-NPS Program and its partners with necessary information related to the BMP selection and planning of watershed restoration projects. With the advent of low altitude infrared imaging, TVA and others have been able to produce extremely useful and accurate presentations of how the land is being used throughout an entire watershed. Similar types of land use information are also being acquired by agencies through on the ground reconnaissance.

These types of information, once stored in a GIS format, will benefit the TDA-NPS Program and its partners. Combining this targeted watershed information with local water quality data will provide the TDA-NPS Program and its partners with information critical to the selection of BMP placement within any targeted watershed.

Regional and statewide land use maps and presentations will also serve as means of targeting 319 Program and cooperating partner funds towards specific watershed projects. Information generated with GIS will also assist in the watershed coordination of UWA and 'grant pool' projects and NRCS funded EQIP projects.

The TDA-NPS Program GIS system will track all BMPs implemented with 319 and Ag Resources Conservation funds. Other partners will also have the opportunity of submitting their BMP information to ensure all activities are tracked and no duplication of effort occurs between agencies. The maps generated with GIS will be useful for local agencies as tools to show other interested landowners the extent of the work that has been accomplished in a particular area.

Collecting and Entering BMP Information

All TDA implemented BMPs will have their pertinent information, including implemented BMP type(s), funding source(s), completion date, and location coordinates, recorded on a standard form. The TDA-NPS Program GIS Coordinator enters the information into the database.

Tracking of Nonpoint Source Water Quality

The GIS will be used for the storage and presentation of surface and subsurface water quality data generated by such cooperating water quality agencies as TDA-Regulatory Services, TDEC-WPC, TDEC-DWS, TWRA, TVA, and USGS. These data will be displayed as statewide, regional, or watershed-specific presentations, while being used to assist in the selection of targeted 'grant pool' and UWA watersheds and targeting subwatersheds within a targeted watershed for BMP implementation. By tracking pertinent water quality parameters at any sampling site downstream of implemented BMPs, the TDA-NPS Program and its cooperating partners will determine whether or not these projects are improving the water quality. These data will also be used by TDA-NPS Program in their TMDL implementation efforts.



Tracking the Re-definition of the 303(d) List

As TDEC-WPC continues its nonpoint source monitoring in each of the watersheds delineated by the Watershed Management Program, its water quality database for nonpoint source areas will continue to grow in amount and coverage area. TDEC's capability to track and present these data has progressed to the point that it can create maps that designate impacted 11- and 14-digit subwatersheds. This type of GIS information will be indispensable to the TDA-NPS Program 'grant pool' and UWA watershed selection processes and should prove to be as valuable in the TMDL development and implementation efforts.

Tracking of Project Types

The TDA-NPS Program will also use GIS to track the locations and types of BMP implementation, education/public awareness projects, and watershed and monitoring projects on a statewide basis. By plotting all of the 319 funded projects, as well as those of the cooperating partners, the TDA-NPS Program will have an excellent programmatic planning tool to share with its partners. Statewide maps will indicate the geographic distribution of nonpoint source category efforts.

Tracking of New Technologies

Progress being made by the TDA-NPS Program and its cooperating partners towards introducing new technologies for septage disposal, construction, urban runoff, stream bank stabilization, abandoned mine lands, among a wide array of other water quality efforts will be tracked geographically on GIS-generated maps. These maps will provide a better understanding of the progress being made as well as what still remains to be addressed in the nps arena.

MILESTONES

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- **Action 1:** Continue to track installed BMPs on GIS system.
Lead Agency: TDA-NPS Program
Key Partners: TDEC-WPC; TN-OIR; USDA-NRCS; TDA-Forestry Division,
Years: 2000-2005

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution.

- **Action 1:** Develop GIS inventories of nonpoint source areas of concern for each nonpoint source category.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; TN-OIR; USDA-NRCS; TDA-Forestry Division
Years: 2003-2005
- **Action 2:** Use GIS coverages to contact all landowners in 303(d) listed watersheds impaired by nonpoint sources.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; TN-OIR; USDA-NRCS; TDA-Forestry Division
Years: By 2003-2005
- **Action 3:** Produce county maps for use as a planning tool by TDA Regional Administrators.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; TN-OIR; USDA-NRCS; TDA-Forestry Division
Year: By 2001-2005

Long Term Goal 6.

Through the process of continuous improvement, routinely assess all programmatic functions of the TDA-NPS Program in order to maximize efficiency, decrease the bureaucratic burden, and increase the numbers of participants in the program.

- **Action 1:** Establish the use of GIS for tracking problems at the county level, so that all ground water problems will be candidates for remediation efforts.
Lead: TDA-NPS Program
Key partners: County governments; Local landowners; Local SCDs; Local water suppliers; Local watershed assn; TDEC-DCA; TDEC-DWS; TDEC-GWP; TDEC-WPC; TVA; UTIA; UT-CTAS; Universities
Year(s): 2000-2005
- **Action 2:** Assist counties in the implementation of such GIS efforts through the sponsorship of training sessions.
Lead: TDA-NPS Program
Key partners: County government; Local landowners; Local SCDs; Local water suppliers; Local watershed assn; TDEC-DCA; TDEC-DWS; TDEC-GWP; TDEC-WPC; TVA; UTIA; UT-CTAS; Universities
Year(s): 2000-2005
- **Action 3:** Incorporate GIS maps into the Annual Report
Lead: TDA-NPS Program
Years: 2002

INTRODUCTION

Through a partnering effort, which included the Tennessee Department of Environment and Conservation-Division of Water Pollution Control (TDEC-WPC), the U.S. Department of Agriculture-Natural Resources Conservation Service (NRCS), and the Tennessee Department of Agriculture-Ag Resources Program (ARP) and Nonpoint Source Program (NPS), eleven priority watersheds, all 8-digit in magnitude, have been submitted to EPA as Unified Watershed Assessment (UWA) projects for FY-99 and FY-00 grant funding.

Based upon the most recent water quality monitoring data available, TDEC-WPC generated a Calculated Percent Impairment map which delineated all of the state's 8-digit watersheds as being 'impaired' (category 1) or 'unimpaired' (category 2). Two other categories 'pristine' and 'insufficient data' were not found within the state. The state's 8-digit watersheds were categorized based upon the known impaired river miles divided by assessed river miles for each of the watersheds. Those watersheds with ratios greater than 10% or 15% were designated as 'impaired' and were candidates for UWA funding efforts.

From these 'impaired' watersheds, the UWA team has selected the eleven priority watersheds. NPS Program staff met with local water quality technical teams to select which 303(d) listed streams within these eleven priority watersheds would be the target of the UWA funding. The local technical team was requested to submit watershed projects for funding consideration which dealt with agricultural issues as the main focus of the project. Agriculture and Resource Extraction were selected because the proficiency of BMP implementation among partners is more advanced for these nps categories than any others.

The following sections represent concise overviews of each of these eleven priority watersheds. Time has been spent on explaining the extent of pollution, partnering efforts, monitoring of water quality before and after BMP implementation, and the rotational strategy between subwatersheds. The prospect of addressing non-agricultural and mining issues has also been explained as part of the overall plan to remove the entire 8-digit watershed from the 303(d) List.

In an effort to reduce the size of this chapter, the TDA-NPS Program has taken the liberty of explaining the functions of the more frequently listed cooperative partners in the following text. As the reader progresses through each of the priority watershed sections they will find that all of the cooperative partners have been listed in the 'Cooperating Agency Programs' subsection. Yet, in the following subsection entitled 'Cooperating Agency Programs (in detail)', the reader will find explanations for only those cooperative partners which are unique to that particular watershed.

TDA-Ag Resources Program

Eight regional administrators (RAs) are located throughout the state to provide local assistance to partnering agencies. All of these individuals are trained and experienced in either agricultural conservation or water quality.

Their role in this watershed is to assist in developing new projects within the watershed by working with the local agency staff. They actually provide a quality control oversight of all implemented BMPs funded through the ARC Fund and the 319 Program. The RAs serve as TDA's approval mechanism on most, if not all, of the BMPs implemented in this watershed. And finally, they serve an important role in the NPS Program educational effort by providing assistance to the public either individually or at public gatherings.

Projects funded by the ARC Fund can supplement those funded by the NPS Program in this watershed too. This, along with the ARC Fund's ability to support information and education efforts, makes it a very important partner to the NPS effort.

TDA-Division of Forestry

TDA foresters are the best individuals to consult for information regarding the reforestation of the many timbered sites in the targeted watershed. Their expertise could lead to forest growths comparable to the original growths found in this region prior to the lumbering operations of the past. TDA foresters can also serve as educators of proper forestry management/water quality techniques.

TDEC-Division of Ground Water Protection

The Division of Ground Water Protection (GWP) recognizes the existing problem and will be an important partner in the effort of reducing the concentrations of pollutants reaching the receiving streams and ground water aquifers. GWP will provide septic system reconnaissance surveys to determine which systems are failing as well as providing dye trace studies to determine its path of subsurface flow.

TDEC-Division of Water Pollution Control

TDEC-WPC will play a key role in the monitoring of the receiving streams before and after the implementation of BMPs throughout the surrounding watershed(s). Their experience in the watershed will provide partners with a keen sense of what water quality parameters need to be addressed. They will also perform the subsequent monitoring which will determine whether the stream(s) will be removed from the 303(d) List.

Outreach efforts will also be a mainstay of TDEC-WPC as it has the ability of conveying to the public what water quality problems actually exist and what remedial actions need to be taken. They will also play a key role in the proceedings of any working group meeting to focus the efforts of all partners in the watershed.

TDEC-Division of Water Supply

TDEC-Division of Water Supply (TDEC-DWS) is interested in the advancement of any efforts that will improve water quality upstream of public water supply intakes across the state. Any abatement or remedial activity that would improve ground water quality would also be of interest to TDEC-DWS.

TDEC-DWS also manages the Source Water Assessment Program (SWAP), which is currently performing pollution source assessment studies along streams for a five mile distance upstream of a specific intake. These studies will produce inventories of sites where nonpoint source water pollution is occurring. A cooperative effort between TDA-NPS Program and TDEC-DWS will resolve many of these problems.

TDH-Division of Lab Services

The Division of Lab Services will provide the pre - and post – BMP implementation water quality monitoring for this UWA-funded watershed. Analyses will be performed as are dictated by the pollutants cited on the 303(d) List. Placement of sampling sites will be based upon knowledge of the watershed problems gained from TDH-DLS interaction with local water quality team members.

The analytical results of this monitoring will provide TDEC-WPC with much needed water quality data in its efforts of determining whether the subwatershed should remain on the 303(d) List. These results will likely be used by TDEC-WPC in its efforts to develop TMDLs.

Tennessee Home Builders Association

The Tennessee Home Builders Association (THBA) has the ability to convey the importance of proper BMPs to this growing construction industry. The THBA has already partnered with the City of Chattanooga in their effort to provide training and certification for developers and homebuilders. The THBA will be a partner in this watershed effort and will be requested to provide whatever assistance it could towards reducing sediment loading and other pollutants to the local receiving streams.

TVA-Resource Stewardship Watershed Team Program

TVA water quality professionals have the ability to generate local involvement while providing water quality expertise. Water quality monitoring as well as aerial photography land use inventory capabilities from TVA provide substantial technical support to this watershed effort. TVA has the financial capability of funding associated projects, which could assist in promoting many of the needed BMPs for this specific watershed.

TWRA

TWRA biologists and water quality professionals are well informed about what aquatic life should be present in the receiving streams as well as what needs to be done to protect and restore flora and fauna. Biological monitoring and participation in working group meetings will be provided by the local TWRA. TWRA could provide information and material to restore the local fisheries as the local water quality improves.

USDA-Natural Resources Conservation Service

The local district conservationist (DC) representing the NRCS will serve as the leading technical advisor as to what agricultural practices need to be installed as well as actually designing the practices, for the most part, and making the contact with the landowner to gain permission to implement the practice(s). When design work exceeds the DC's level expertise, the NRCS engineer will be called upon to provide the design. All Ag-related practices will be in compliance with NRCS specifications.

The ability of the DC to work with landowners as well as the local SCD, TDA regional administrators, and RC&D Coordinator, if one is present, will be crucial to the success of the project. The DC will also develop and distribute public awareness materials.

USDA funds for water quality improvement are available to private landowners through the Environmental Quality Incentive Program (EQIP) and other conservation programs

through the Natural Resources Conservation Service and the Farm Services Agency.
(NRCS)

USDI-Fish & Wildlife Service

USF&WS has been funding and assessing water quality in the streams of Tennessee for many years. This agency provides considerable expertise in the field of biological integrity as well as funding assistance in certain cases. By maintaining a partnership between USF&WS and USDA-NRCS, TDEC-WPC, and TDA-NPS Program, biological integrity information will be shared and an assessment as to the success of the Acid Mine Drainage remediation efforts will occur.

USDI-Geological Survey

The U.S. Geological Survey (USGS) will provide monitoring information obtained from their mainstem sampling sites throughout the 8-digit watershed. This information will prove to be useful in determining which parameters need to be assessed and whether the stream can be removed from the 303(d) List. The USGS will provide technical assistance as needed for local ground water issues.

UT Ag. Extension Service

UT Ag Extension Service (UTAES) has the capability of providing an important level of education and outreach to the citizens of this watershed. UTAES has the ability to provide service to agricultural and urban areas of the watershed. This local effort will stimulate the level of stewardship needed among the watershed citizenry to guarantee the successful implementation and maintenance of water quality BMPs. This effort will be easily paired with any 319 BMP implementation in the watershed.

UT-County Technical Assistance Service

As the county government initiates water quality BMPs for construction and urban runoff problems U.T.-County Technical Assistance Service (UT-CTAS) will serve an important role toward assisting the local departments with technical expertise and know-how while planning and implementation stages are in progress. This effort will be easily paired with any 319 BMP implementation in the watershed.

3.1 CUMBERLAND RIVER BASIN: BIG SOUTH FORK – BEAR CREEK



DESCRIPTION and EXTENT OF PROBLEM

According to the 1998 303(d) List more than 19 miles of the Big South Fork – Bear Creek watershed is not supporting its designated uses due to sediment loadings and low pH caused by abandoned surface and deep coal mines. Currently, the water of both East and West Branch of Bear Creek are lifeless. Even so, an effort has been underway for ten years to remediate many of these problems. The following explains what has occurred so far and what is planned for the future.

1998 303(d) LIST

WATERSHED NAME

Bear Creek – West Branch
 Bear Creek – East Branch
 North White Oak Creek
 White Oak Creek (incl. Bone Camp, Black Wolf)
 Brimstone Creek
 Straight Fork Creek

SOURCES

abandoned mining
 abandoned mining
 abandoned mining
 abandoned mining
 abandoned mining
 abandoned mining

SUBWATERSHED ROTATIONAL PLAN

Currently, Bear Creek, East and West Branches, are the only watersheds that have been considered as acid mine drainage (AMD) projects in the Big South Fork of the Cumberland watershed. Attention is being focused on addressing AMD issues in the West Branch, while a recently completed 319-reclamation project has addressed AMD issues in East and West Branches.

Of the remaining proposed reclamation sites in West Branch, TDEC-AML, in partnership with TDA-NPS Program, has made a commitment to address roughly half of the remaining AMD sites, while the USDA-NRCS has agreed to address the remaining sites.

When USDA-NRCS meets its commitment, the TDEC/TDA partnership will be completed in the West Branch. At that time, further work in East Branch would be considered. Once all feasible work has been completed in the Bear Creek subwatershed, the TDEC/TDA partnership will address other Big South Fork subwatersheds, until all subwatersheds in the eight-digit HUC area have been restored.

COOPERATING PARTNERS

Partners

City of Oneida
 Kentucky Department of Environmental Protection
 Division of Water-Nonpoint Source Program
 Local landowners
 Scott County government
 Scott County Soil Conservation District
 Tennessee Citizens for Wilderness Planning

Abbreviation

KY-NPS

SCD
 TCWP

3.1 CUMBERLAND RIVER BASIN: BIG SOUTH FORK – BEAR CREEK



Tennessee Department of Agriculture	
Ag Resources Conservation Fund	TDA-ARC
Division of Forestry	TDA-Forestry
Tennessee Department of Environment & Conservation	
Division of Water Pollution Control	TDEC-WPC
Land Reclamation Section	TDEC-LRS
Tennessee Department of Health	
Division of Lab Services	TDH-DLS
U.S. Department of Agriculture	
Natural Resource Conservation Service	USDA-NRCS
U.S. Department of Interior	
Bureau of Mines	USDI-BM
Fish & Wildlife Service	USDI-F&WS
National Park Service	USDI-NPS
Big South Fork-National River & Recreational Area	BISO
Office of Surface Mining	OSM

City of Oneida

As the City of Oneida continues to grow northward among the many reclaimed and un-reclaimed mine sites of the East and West Branches of Bear Creek, it will need to preserve the effectiveness of the BMPs. Education efforts by the county addressing construction and urban runoff issues will need to be initiated. Landowners of this portion of the city will also need to be aware of the role they play in restricting the pollutants which reach these receiving streams.

KDEP-Division of Water-NPS Program

The Kentucky Division of Water-NPS Program has been quite interested the progress being made in Tennessee towards remediating the many acid mine drainage sites there. Where Bear Creek flows northward into Kentucky monitoring sites have been positioned and water quality samples have been acquired and assessed. The State of Tennessee looks forward to receiving periodic water quality updates from Kentucky as a gauge to the progress being made towards improving water quality in this watershed.

Local landowners

Individual landowners will be requested to participate in the implementation of BMPs by allowing the BMP to be placed on their property, contributing to the construction of the BMP through in-kind services, and maintaining the BMP for a pre-determined or indefinite period of time. These same landowners will also be requested to allow others to visit the BMP once it has been constructed.

Scott County government

As Scott County continues to grow among the many reclaimed and un-reclaimed mine sites of the East and West Branches of Bear Creek it will need to remain aware of the reclamation work having been done there, so that all measures will be taken to preserve these effective BMPs. Education efforts by the county addressing construction and urban runoff issues will need to be initiated. Landowners of this portion of the county will

3.1 CUMBERLAND RIVER BASIN: BIG SOUTH FORK – BEAR CREEK



also need to be aware of the role they play in restricting the pollutants which reach these receiving streams.

Scott County SCD

The Soil Conservation District is an active partner in the effort to reduce the introduction of sediment loadings and other contaminants to the local receiving streams. Through their capabilities to leverage funding from the 319 Program, the SCD, as a primary state contractor, can provide a significant amount of financial assistance to local water quality remediation efforts. Through its direct interaction with the local NRCS district conservationist, the SCD can also direct technical as well as administrative assistance to local water quality remediation efforts.

The SCD can also serve as a leader in the effort to increase water quality stewardship of local citizens and operators. SCDs are active in the effort to continue water quality correction and reduction efforts long after state and other outside funds have been reduced and/or eliminated.

Tennessee Citizens for Wilderness Planning

Many members of Tennessee Citizens for Wilderness Planning are residents of the Cumberland Mountains and Plateau where all of Tennessee's coal-related AMD problems exist. It is in this groups' best interest to learn more of what is being achieved in the Bear Creek watershed so they can assist in disseminating this information to other groups. By doing so, a heightened awareness could promote the funding for AMD projects for many years to come.

TDEC-WPC-Land Reclamation Section

The TDA-NPS Program will continue to partner with this agency in an effort to correct all AMD sites in the Big South Fork of the Cumberland region as well as all of the other AMD watersheds further to the southwest.

The TDA-NPS Program has entered into a contract to provide 319 funds for the reclamation of roughly half of the AMD sites found in the West Branch of the Bear Creek watershed. Once these sites are reclaimed by TDEC-WPC, this partnership will either address any work remaining in the West Branch or will refocus its efforts towards the East Branch where much work has already been accomplished by the partnership.

USDI-Bureau of Mines

The USDI-Bureau of Mines is a source of reclamation information for the partners to rely upon. Maintaining partnerships between USDI-BM and USDA-NRCS, TDEC-WPC, and TDA-NPS Program will lead to the greatest exchange of information possible.

USDI-National Park Service

The northern half of Big South Fork-National River & Recreational Area (BISO) is positioned downstream of Bear Creek and will benefit from these remediation efforts. Water quality monitoring and public awareness efforts are a part of BISO's existing watershed management plan. By partnering with USDA-NRCS, TDEC-WPC, and TDA-NPS Program, USDI-NPS should be able to provide opportunities for its visitors to learn

3.1 CUMBERLAND RIVER BASIN: BIG SOUTH FORK – BEAR CREEK



more about what is being accomplished in the Bear Creek watershed, thereby increasing the probability of future remediation project funding.

USDI-Office of Surface Mining

USDI-OSM has always been interested in the success of AMD remediation/reclamation efforts. From these efforts, new technologies and attitudes are achieved to be used in its active mine regulatory programs throughout the nation. A healthy partnering environment between USDI-OSM and USDA-NRCS, TDEC-WPC, and TDA-NPS Program should lead to the greatest exchange of information possible.

CURRENT 319 PROJECTS

The following is a listing of what 319 projects are currently addressing water quality issues in Big South Fork – Bear Creek – East and West Branch subwatersheds.

Grant Yr.	Project Title	Partner
FY-93	AMD Remediation in BSF-Bear Creek	TDEC-WPC-LRS
FY-99	NPS water quality monitoring/assessment	TDEC-WPC
FY-99(UWA)	BSF-Bear Creek-West Branch AMD Remediation	TDEC-WPC-LRS
FY-99(UWA)	BSF-Bear Creek-West Branch pre-BMP monitoring	TDH-DLS

CURRENT MONITORING & ASSESSMENT

TDEC-WPC five-year watershed management approach
TDH-DLS pre- and post- BMP monitoring

MEASURES OF SUCCESS

- UWA projects have been implemented in all subwatersheds on the 1998 303(d) List in increasing numbers each year.
- Post BMP implementation monitoring results are indicating an overall improvement of the water quality of streams.
- The subwatersheds have been removed from the 1998 303(d) List due to sufficient water quality improvements.
- Plans have been developed to address the remaining 303(d) listed AMD watersheds in the Big South Fork watershed.

**3.1 CUMBERLAND RIVER BASIN:
BIG SOUTH FORK – BEAR CREEK**



MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, strengthen existing partnerships and to foster greater trust, commitment and accountability.

- **Action:** Conduct an annual priority watershed partners meeting for project coordination.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDH-DLS; USDI-BISO; local governments
Year(s): 2001-2005
- **Action:** Develop a Watershed Restoration Action Strategy.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDEC-DWS-GWMS
Year(s): 2001

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- **Action:** All of the 1999 UWA AMD sites in the Big South Fork – Bear Creek – East and West Branch subwatersheds will be remediated.
Lead: TDEC-WPC and USDA-NRCS
Key Partner: TDA-NPS Program
Year(s): 2005
- **Action:** Forty percent of the remaining surface and subsurface AMD sites in the Big South Fork – Bear Creek - East Branch subwatershed will be remediated.
Lead: TDEC-WPC and USDA-NRCS
Key Partner: TDA-NPS Program
Year(s): 2010
- **Action:** Water quality of the Big South Fork – Bear Creek - West Branch subwatershed will indicate improvement due to the BMP implementation efforts.
Lead: TDEC-WPC and TDH-DLS
Key Partners: TDA-NPS Program
Year(s): 2005
- **Action:** Water quality of Big South Fork – Bear Creek – East Branch subwatershed will indicate improvement due to the BMP implementation efforts.

**3.1 CUMBERLAND RIVER BASIN:
BIG SOUTH FORK – BEAR CREEK**



Lead: TDEC-WPC and TDH-DLS
Key Partners: TDA-NPS Program
Year(s): 2010

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution.

- **Action:** Develop at least two educational projects to educate the local citizens, landowners, and elected officials in the Big South Fork – Bear Creek subwatershed.

Lead: TDA-NPS Program
Key Partner: TDEC-WPC; USDA-NRCS and UDSI-BISO
Year(s): 2005

Long Term Goal 7.

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

- **Action:** Pre-BMP implementation monitoring will have been completed and post-BMP implementation monitoring will be in progress in the Big South Fork – Bear Creek – West Branch subwatershed.

Lead: TDEC-WPC and TDH-DLS
Key Partners: TDA-NPS Program, USDA-NRCS
Year(s): 2005
- **Action:** Post-BMP implementation monitoring will have been completed in the Big South Fork – Bear Creek – West Branch subwatershed.

Lead: TDEC-WPC and TDH-DLS
Key Partners: TDA-NPS Program, USDA-NRCS
Year(s): 2010
- **Action:** Pre-BMP implementation monitoring will have been completed in the Big South Fork – Bear Creek – East Branch subwatershed.

Lead: TDEC-WPC and TDH-DLS
Key Partners: TDA-NPS Program, USDA-NRCS
Year(s): 2010

3.2 CUMBERLAND RIVER STONES RIVER – EAST FORK



DESCRIPTION and EXTENT OF PROBLEM

According to the 1998 303(d) List more than 70 miles are partially supporting while more than 10 miles are not supporting in the Stones River – East Fork because of agriculture and construction practices. As the city of Murfreesboro grows through the East Fork subwatershed, the remediation will need to shift away from agriculture and concentrate on construction and urban runoff. An agricultural effort will set the stage for additional and more extensive remediation and prevention efforts addressing these two nonpoint source issues.

1998 303(d) LIST

WATERSHED NAME

East Fork-Wades Branch

East Fork-Bear Branch

East Fork-Cripple Creek

East Fork-McKnight & Cavender Creeks

East Fork-Bradley & Jarman Creeks

SOURCES

siltation/pastureland

habitat alteration/pastureland

siltation/pastureland

habitat alteration/pastureland

organic enrichment/pastureland

habitat alteration/pastureland

siltation/pastureland

habitat alteration/agriculture

siltation/pastureland

organic enrichment/pastureland

habitat alteration/pastureland

SUBWATERSHED ROTATIONAL PLAN

The Stones River watershed is not currently receiving 319 funding. If an agricultural related project is initiated, it is probable that it might be the only of its kind as the watershed has undergone residential and commercial growth during the past several years. More than likely, the emphasis will quickly shift from agriculture to construction and urban runoff. Many of the impaired streams are in highly urbanized subwatersheds.

The TDA-NPS Program staff has intentions of meeting with the county commission, SCD Board, and other county and city officials to discuss future projects. Preliminary meetings have been held, so it is hoped that in the not too distant future 319 projects will be initiated to address the major nonpoint source issues of the watershed.

COOPERATING PARTNERS

Partners

Local contractors & home builders

Local landowners

Rutherford County government

Rutherford County Soil Conservation District

Tennessee Department of Agriculture

Ag Resources Conservation Program

Abbreviations

SCD

TDA -ARC

3.2 CUMBERLAND RIVER STONES RIVER – EAST FORK



Tennessee Department of Environment & Conservation	
Division of Water Pollution Control	TDEC-WPC
Division of Water Supply	TDEC-DWS
Ground Water Management Section	TDEC-GWMS
Tennessee Department of Health	
Division of Lab Services	TDH-DLS
Tennessee Home Builders Association	THBA
U.S. Department of Agriculture	
Natural Resources Conservation Service	USDA-NRCS
U.T. Institute of Agriculture	UTIA
U.T. County Technical Assistance Service	UT-CTAS

Local contractors & home builders

Rutherford County is rapidly growing with many rural areas becoming sub-urbanized. Agricultural-related problems are giving way to construction and urban runoff problems, an issue, which can be minimized if developers, contractors, and home builders make the effort to eliminate sediment loadings and high stormwater discharges.

Much of this area will fall within the NPDES phase II regulations, but the TDA-NPS Program has coordinated with the local planning commission to introduce nonpoint source technologies prior to the 2003 NPDES start-up.

Local landowners

Landowners will be requested to participate in the implementation of BMPs by allowing the BMP to be placed on their property, contributing to the construction of the BMP through in-kind services, and maintaining the BMP for an indefinite period of time. These same landowners will also be required to allow others to visit the BMP once it has been fully constructed.

Rutherford County government

As Rutherford County residential and commercial growth takes the remaining farmlands of the Stones River – East and West Fork watersheds, its officials and residents will need to remain aware of and protect the existing BMPs that have been installed. Developers, government officials, and landowners will also need to adopt the water quality stewardship demonstrated by the preceding farmers as they go about constructing the new developments.

Rutherford County SCD

The Soil Conservation District is an active partner in the effort to reduce nonpoint source pollution to the local waters. The SCD can provide a significant amount of financial assistance to local water quality efforts. Through its direct interaction with the local NRCS district conservationist, the SCD can also direct technical as well as administrative assistance to local water quality projects.

The SCD also serves as a leader in the effort to increase water quality education of the local citizens and operators.

**3.2 CUMBERLAND RIVER
STONES RIVER – EAST FORK**



MONITORING & ASSESSMENT

TDEC-WPC five-year watershed management approach
TDH-DLS 319 monitoring

MEASURES OF SUCCESS

- UWA projects have been implemented in all 303(d) listed subwatersheds with a large portion of the required pollutant source sites having been addressed.
- Post BMP implementation monitoring results are indicating an overall improvement of the water quality of the streams directly affected by BMP implementation.
- The subwatersheds once 303(d) listed have been removed due to sufficient water quality improvements.

MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, strengthen existing partnerships and to foster greater trust, commitment and accountability.

- **Action:** Conduct an annual priority watershed partners meeting for project coordination.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDH-DLS; SCD; local governments
Year(s): 2001-2005
- **Action:** Develop a Watershed Restoration Action Strategy.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDEC-DWS-GWMS
Year(s): 2001

**3.2 CUMBERLAND RIVER
STONES RIVER – EAST FORK**



Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- **Action:** Twenty percent of the needed agricultural BMPs will have been implemented in the Stones River - East Fork subwatershed.
Lead: SCD and local governments
Key Partners: USDA-NRCS; TDA-NPS Program
Year(s): 2005
- **Action:** Twenty percent of the subwatersheds will be fully supporting their designated uses due to BMP implementation in the Stones River – East Fork subwatershed
Lead: SCD; USDA-NRCS and local governments
Key Partners: TDA-NPS Program
Year(s): 2005

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution.

- **Action:** Develop at least two educational projects to educate the local citizens, landowners, and elected officials in the Stones River – East Fork subwatershed.
Lead: TDA-NPS Program
Key Partner: TDEC-WPC; USDA-NRCS; SCD and local governments
Year(s): 2005

Long Term Goal 7.

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

- **Action:** Pre-BMP implementation monitoring will have been completed in the Stones River – East Fork subwatershed.
Lead: TDEC-WPC and TDH-DLS
Key Partners: TDA-NPS Program; local governments
Year(s): 2005

3.3 CUMBERLAND RIVER BASIN RED RIVER – SULPHUR FORK



DESCRIPTION and EXTENT OF PROBLEM

According to the 1998 303(d) List, more than 29 miles of Sulphur Fork Creek is partially supporting because of sediment loading caused by agricultural activity. Construction and the need for stream bank stabilization are also growing sources of siltation in this UWA watershed.

1998 303(d) LIST

WATERSHED NAME

Red River-Sulphur Fork

SOURCES

siltation/agriculture

SUBWATERSHED ROTATIONAL PLAN

The Sulphur Fork Creek watershed is currently receiving 319 and match funding through an FY-97 grant. The Millers Creek subwatershed was selected because of its agricultural predominance. As the FY-97 grant progresses the project manager, APSU, also manager of the Millers Creek UWA project, should be able to determine, with assistance from TDEC, which Sulphur Fork Creek subwatershed should be addressed next with UWA funding. As is common in most of the UWA watersheds, agricultural BMP activity is more advanced than other nonpoint source issues.

It is important to note that while these UWA efforts are ongoing, the base grants will also be funding demonstration BMPs and public awareness efforts throughout the watershed. These efforts will address failing septic systems, construction, and possibly urban runoff issues.

The next watershed to be addressed with UWA funds would be Brush Creek, to the west and further from the urbanization of the City of Springfield, and possibly Beaver Dam Creek, which is east and upstream of the City of Springfield. As urban runoff and construction issues are better understood by local partners, the subwatersheds of Hood, Caleb, and Carr creeks will be included as UWA watershed projects. Once all of these subwatersheds have been addressed with sufficient BMP implementation efforts, Sulphur Fork Creek should likely be removed from the 303(d) List.

COOPERATING PARTNERS

Partners

Austin Peay State University
Center for Field Biology
Five Rivers RC&D Council
Local developers & home builders
Local landowners
Robertson County government
Robertson County Soil Conservation District
City of Springfield
Tennessee Department of Agriculture

Abbreviations

APSU

RC&D

SCD

3.3 CUMBERLAND RIVER BASIN RED RIVER – SULPHUR FORK



Ag Resources Conservation Program	TDA-ARC
Tennessee Department of Environment & Conservation	
Division of Water Pollution Control	TDEC-WPC
Tennessee Home Builders Assoc.-Middle Tennessee	THBA
U.T. Institute of Agriculture	UTIA
U.T. County Technical Assistance Service	UT-CTAS
U.S. Department of Agriculture	
Natural Resource Conservation Service	USDA-NRCS
U.S. Department of Interior	
Geological Survey	USGS

APSU-Center for Field Biology

Austin Peay State University (APSU) is the manager of the Millers Creek watershed project. A partnership has already begun between APSU, TDEC-WPC, USDA-NRCS, RC&D and UTIA. The USDA-NRCS will do BMP implementation, TDEC-WPC will fulfill the water quality monitoring requirements of the project, and the RC&D and UTIA will perform educational activities.

Five Rivers RC&D Council

The local RC&D Council can manage projects, implement BMPs, and provide education to the public. The RC&Ds ability in these areas will lead the development of more projects as well as projects in adjacent watersheds.

Local developers & home builders

Robertson County is rapidly growing with many rural areas becoming sub-urbanized. Agricultural-related problems are giving way to construction and urban runoff problems, an issue, which can be minimized if developers, contractors, and home builders make the effort to eliminate sediment loadings and high stormwater discharges. The NPS Program has coordinated with local officials, through a FY-99 grant project to introduce nonpoint source technologies to the area.

Local landowners

Landowners will be requested to participate in the implementation of BMPs by allowing the BMP to be placed on their property, contributing to the construction of the BMP through in-kind services, and maintaining the BMP for a pre-determined or indefinite period of time. These same landowners will also be required to allow others to visit the BMP once it has been fully constructed.

Local Government

As Robertson County residential and commercial growth continues to take some of the remaining farmlands of the Red River - Sulphur Fork Creek watershed, its officials and residents will need to remain aware of and protect the existing Ag-related remediation work already in place. More importantly, government officials need to assume a leadership role in the nonpoint source effort by establishing water quality control measures for all construction sites and stormwater problem areas as growth continues.

3.3 CUMBERLAND RIVER BASIN RED RIVER – SULPHUR FORK



City officials will be encouraged to work with local landowners and contractors to at least investigate the possibilities of installing BMPs to reduce construction and urban-related runoff. Even though initial BMPs implemented in the watershed will be of an agricultural nature, the city officials, landowners, and contractors will be provided an opportunity to learn how these BMPs can be converted to more urbanized usage.

Robertson County Soil Conservation District

The Soil Conservation District is a partner in the effort to reduce nonpoint source pollution to the local waters. The SCD can provide a significant amount of financial assistance to local water quality efforts. Through its direct interaction with the local NRCS district conservationist, the SCD can also direct technical as well as administrative assistance to local water quality projects. The SCD also serves as a leader in the effort to increase water quality education of the local citizens and operators.

CURRENT 319 PROJECTS

The FY-97 grant project, Reducing NPS Pollution in the Sulphur Fork Creek Watershed, will demonstrate BMPs for a wide variety of nonpoint source categories in subwatersheds of the Sulphur Fork Creek watershed. The degree of impact originating from the nonpoint source issues varies from one subwatershed to the next. The closer the subwatershed is to the city of Springfield the more construction and urban runoff issues need to be demonstrated. While the FY-99 UWA project will be addressing the predominately agricultural Millers Branch subwatershed, a FY-99 Base project addresses urban runoff demonstration in the city of Springfield.

The following is a listing of what 319 projects have addressed water quality issues in Red River-Sulphur Fork watershed.

Grant Yr.	Project Title	Partner
FY-97	Reducing NPS Pollution in the Sulphur Fork Creek W'shed	APSU
FY-99	Urban Runoff NPS Demonstration & Education Project	5Rivers
RC&D		
FY-99(UWA)	Red River Water Quality Restoration Project: Sulphur Fork	APSU

CURRENT MONITORING & ASSESSMENT

TDEC-WPC five-year watershed management approach
TDH-DLS pre- and post- BMP monitoring
APSU 319 monitoring

MEASURES OF SUCCESS

- UWA projects have been implemented in all 303(d) listed subwatersheds.
- Base projects have been implemented in all 303(d) listed subwatersheds which require the introduction of un-addressed nps categories (i.e. failing septic systems, construction, and urban runoff) through demonstration projects.

3.3 CUMBERLAND RIVER BASIN RED RIVER – SULPHUR FORK



- Post BMP implementation monitoring results are indicating an overall improvement of the water quality of the streams directly affected by BMP implementation.
- The subwatersheds once 303(d) listed have been removed due to sufficient water quality improvements.

MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, strengthen existing partnerships and to foster greater trust, commitment and accountability.

- **Action:** Conduct an annual priority watershed partners meeting for project coordination.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDH-DLS; local governments
Year(s): 2001-2005
- **Action:** Develop a Watershed Restoration Action Strategy.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDEC-DWS-GWMS
Year(s): 2001

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- **Action:** Twenty percent of the needed agricultural BMPs will have been implemented in the Red River – Sulphur Fork watershed.
Lead: USDA-NRCS; APSU; RC&D; SCD
Key Partners: TDA-NPS Program
Year(s): 2005
- **Action:** One hundred percent of the needed agricultural BMPs will have been implemented in the Red River – Sulphur Fork – Millers Creek subwatershed.
Lead: USDA-NRCS; APSU; RC&D; SCD
Key Partners: TDA-NPS Program
Year(s): 2005

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution.

3.3 CUMBERLAND RIVER BASIN RED RIVER – SULPHUR FORK



- **Action:** Develop at least two educational projects to educate the local citizens, landowners, and elected officials in the Red River – Sulphur Fork subwatershed.
Lead: TDA-NPS Program
Key Partner: TDEC-WPC; RC&D; APSU; SCD
Year(s): 2005

Long Term Goal 7.

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

- **Action:** Pre-BMP implementation monitoring will have been completed in all of the subwatersheds of the Red River – Sulphur Fork watershed.
Lead: TDEC-WPC; APSU; TDH-DLS
Key Partners: TDA-NPS Program
Year(s): 2005
- **Action:** Water quality of the Red River – Sulphur Fork – Millers Creek subwatershed will be indicating a trend towards being fully supporting its designated uses.
Lead: TDEC-WPC and TDH-DLS
Key Partners: APSU; USDA-NRCS; SCD
Year(s): 2005

3.4 TENNESSEE RIVER BASIN WATAUGA RIVER - ROAN & (ROARING) FORGE CREEKS



DESCRIPTION and EXTENT OF PROBLEM

According to the 1998 303(d) List, 6.7 miles of the Watauga River – Roan and Roaring Forge Creek watersheds are partially supporting due to sediment loadings from agricultural activities.

1998 303(d) LIST WATERSHED NAME

Roan Creek
(Roaring) Forge Creek

SOURCES

siltation/agriculture
siltation/agriculture

SUBWATERSHED ROTATIONAL PLAN

The Roan Creek watershed will receive 319 funding through a FY-00 UWA grant. The subwatershed, along with Roaring Forge Creek, was selected because of their agricultural predominance. As the FY-00 grant progresses the project manager, Johnson County SCD, should be able to determine, with assistance from TDEC, if construction in the watershed should be addressed next with UWA funding. As is common in most of the UWA watersheds, agricultural BMP activity is more advanced than other nonpoint source issues.

The next watershed to be addressed with UWA funds would more than likely be, Beaverdam Creek in Shady Valley, if it is determined a significant natural resource is being impacted and needs protection.

Several other Watauga subwatersheds will be candidates for future UWA funding. These subwatersheds have pollutants such as pathogens, siltation, and habitat alteration and pollutant sources, which include pasturelands, agriculture, land development, urban runoff, and stormwater according to the 1998 303(d) List. They are: Boones Creek; Cash Hollow Creek; Brush Creek; Sinking Creek; and Doe River.

COOPERATING PARTNERS

Partners

Appalachian RC&D Council
City of Mountain City
Johnson County Soil Conservation District
Johnson County government
Local landowners
Tennessee Department of Agriculture
 Ag Resources Conservation Program
Tennessee Department of Environment & Conservation
 Division of Water Pollution Control
 Division of Water Supply
 Ground Water Management Program
Tennessee Home Builders Association

Abbreviations

RC&D

SCD

TDA -ARC
TDEC-WPC
TDEC-DWS-GWMP
THBA

**3.4 TENNESSEE RIVER BASIN
WATAUGA RIVER - ROAN &
(ROARING) FORGE CREEKS**



Tennessee Valley Authority	TVA
Resource Stewardship Watershed Team Program	
Tennessee Wildlife Resource Agency	TWRA
U.S. Department of Agriculture	
Natural Resources Conservation Service	USDA-NRCS
U.T. Institute of Agriculture	UTIA
U.T.-County Technical Assistance Service	UT-CTAS

Appalachian RC&D Council

The local RC&D Council will provide project management as well as BMP implementation and public awareness. The RC&Ds ability in these areas will be crucial to the generation of projects now and in the future.

City of Mountain City

City officials will be encouraged to work with local landowners and contractors to at least investigate the possibilities of installing BMPs to reduce construction and urban-related runoff. Even though initial BMPs implemented in the watershed will be of an agricultural nature, the city officials, landowners, and contractors will be provided an opportunity to learn how these BMPs can be converted to more urbanized usage. By doing so, if the watershed has been placed on the 303(d) List for stormwater problems, the city will be better informed as to the necessity of such actions and will be more likely to participate in subsequent water quality abatement and remediation efforts directed towards stormwater.

Johnson County government

As Johnson County residential and commercial growth continues to take the remaining farmlands of the Watauga River - Roan Creek watershed, its officials and residents will need to remain aware of and protect the existing Ag-related remediation work already in place. More importantly, government officials need to assume a leadership role in the nonpoint source effort by establishing water quality control measures for all construction sites and stormwater problem areas as growth continues.

Johnson County Soil Conservation District (SCD)

The SCD is a partner in the effort to reduce nonpoint source pollution to the local waters. The SCD can provide a significant amount of financial assistance to local water quality efforts. Through its direct interaction with the local NRCS district conservationist, the SCD can also direct technical as well as administrative assistance to local water quality projects. The SCD also serves as a leader in the effort to increase water quality education of the local citizens and operators.

Local landowners

Landowners will be requested to participate in the implementation of BMPs by allowing the BMP to be placed on their property, contributing to the construction of the BMP through in-kind services, and maintaining the BMP for a pre-determined or indefinite period of time. These same landowners will also be required to allow others to visit the BMP once it has been fully constructed.

3.4 TENNESSEE RIVER BASIN WATAUGA RIVER - ROAN & (ROARING) FORGE CREEKS



CURRENT 319 PROJECTS

The following is a listing of what 319 projects have addressed water quality issues in Watauga River-Roan and Roaring Forge Creek watersheds.

Grant Yr.	Project Title	Partner
FY-2000(UWA)	Watauga R. Water Quality Restoration Project: Roan Cr.	JCSCD

CURRENT MONITORING & ASSESSMENT

TDEC-WPC five-year watershed management approach
TDH-DLS pre- and post- BMP monitoring

MEASURES OF SUCCESS

- UWA projects have been implemented in all 303(d) listed subwatersheds.
- Base projects have been implemented in all 303(d) listed subwatersheds, which require the introduction of un-addressed nps categories (i.e. streambank stabilization) through demonstration projects.
- Post BMP implementation monitoring results are indicating an overall improvement of the water quality of the streams directly affected by BMP implementation.
- The subwatersheds once 303(d) listed have been removed due to sufficient water quality improvements.

MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, strengthen existing partnerships and to foster greater trust, commitment and accountability.

- **Action:** Conduct an annual priority watershed partners meeting for project coordination.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDH-DLS; local governments
Year(s): 2001-2005
- **Action:** Develop a Watershed Restoration Action Strategy.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDEC-DWS-GWMS
Year(s): 2001

**3.4 TENNESSEE RIVER BASIN
WATAUGA RIVER - ROAN &
(ROARING) FORGE CREEKS**



Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- **Action:** Twenty percent of the needed BMPs will have been installed in the Watauga River watershed.
Lead: USDA-NRCS; SCD and RC&D
Key Partners: TDA-NPS Program
Year(s): 2005
- **Action:** One hundred percent of the needed agricultural BMPs will have been implemented in the Watauga River – Roan and Forge Creek subwatersheds.
Lead: USDA-NRCS; RC&D; SCD
Key Partners: TDA-NPS Program
Year(s): 2005

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution.

- **Action:** Develop at least two educational projects to educate the local citizens, landowners, and elected officials in the Watauga River – Roan & (Roaring) Forge Creeks subwatersheds.
Lead: TDA-NPS Program
Key Partner: TDEC-WPC; USDA-NRCS; SCD; TVA
Year(s): 2005

Long Term Goal 7.

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

- **Action:** One hundred percent of the pre-BMP implementation monitoring will have been completed in the Watauga River – Roan and Forge Creek subwatersheds.
Lead: TDEC-WPC and TDH-DLS
Key Partners: TDA-NPS Program
Year(s): 2005
- **Action:** The water quality of the Watauga River – Roan and Forge Creek subwatersheds will be improved.
Lead: TDEC-WPC
Key Partners: TDH-LDS and TDA-NPS Program
Year(s): 2005

3.5 TENNESSEE RIVER BASIN FRENCH BROAD RIVER – LITTLE PIGEON RIVER – EAST FORK/DUNN CREEK



DESCRIPTION and EXTENT OF PROBLEM

According to the 1998 303(d) List, more than 107 miles of the Little Pigeon River – East Fork/Dunn Creek is partially supporting due to nutrient and sediment loadings from agricultural activities. East Fork is the only agricultural subwatershed in Little Pigeon River watershed.

1998 303(d) LIST

WATERSHED NAME

Little Pigeon River-East Fork-Dunn Creek

SOURCES

nutrients & siltation/agriculture

SUBWATERSHED ROTATIONAL PLAN

The East Fork of the Little Pigeon River watershed will receive 319 funding through the FY-00/UWA grant. The Dunn Creek subwatershed was selected because of its agricultural predominance. As the FY-00 UWA grant progresses the project manager, Sevier County SCD, should be able to determine, with assistance from TDEC, which Little Pigeon River subwatershed should be addressed next with UWA funding.

As is common in most of the UWA watersheds, agricultural BMP activity is more advanced than other nonpoint source issues. Most of the remaining subwatersheds within the Little Pigeon River watershed are highly developed by commercial and residential activities. Yet, time should demonstrate a growing level of expertise in the construction and urban runoff issues, thereby allowing other subwatersheds that are less agriculturally oriented, to be addressed with UWA funds.

It is important to note that while these UWA efforts are on going the base grants will also be funding demonstration BMPs and public awareness efforts throughout the watershed. These efforts will address failing septic systems, construction, and possibly urban runoff issues. These nonpoint source issues could be intensely addressed once a probable cooperating partner, the U.S. Army Corps of Engineers, has established goals for its Little Pigeon River – West Prong water quality project.

COOPERATING PARTNERS

Partners

Local developers & home builders
Local landowners
Sevier County government
Sevier County Soil Conservation District
Smoky Mountain RC&D Council
Tennessee Department of Agriculture
 Ag Resources Conservation Program
Tennessee Department of Environment & Conservation
 Division of Water Pollution Control
 Division of Water Supply

Abbreviations

SCSCD
SM RC&D

TDA-ARC

TDEC-WPC
TDEC-DWS

3.5 TENNESSEE RIVER BASIN FRENCH BROAD RIVER – LITTLE PIGEON RIVER – EAST FORK/DUNN CREEK



Tennessee Department of Health	TDH-DLS
Division of Lab Services	THBA
Tennessee Home Builders Association	TVA
Tennessee Valley Authority	
Resource Stewardship Watershed Team Program	
U.S. Army Corps of Engineers	USACE
U.S. Department of Agriculture	
Natural Resource Conservation Service	USDA-NRCS
U.T. Institute of Agriculture	UTIA
U.T.-County Technical Assistance Service	UT-CTAS

Local developers & home builders

Sevier County is rapidly growing with many rural areas becoming sub-urbanized. Agricultural-related problems are giving way to construction and urban runoff problems, an issue, which can be minimized if developers, contractors, and home builders make the effort to eliminate sediment loadings and high stormwater discharges. The TDA-NPS Program has coordinated with local officials, through a FY-99 grant project to introduce nonpoint source technologies to the area.

Local landowners

Landowners will be requested to participate in the implementation of BMPs by allowing the BMP to be placed on their property, contributing to the construction of the BMP through in-kind services, and maintaining the BMP for a pre-determined or indefinite period of time. These same landowners will also be required to allow others to visit the BMP once it has been fully constructed.

Sevier County government

As Sevier County residential and commercial growth continues to take the remaining farmlands of the Little Pigeon River – East Fork watershed, its officials and residents will need to remain aware of and protect the existing Ag-related remediation work already in place. More importantly, government officials need to assume a leadership role in the nps effort by establishing water quality control measures for all construction sites and stormwater problem areas as growth continues.

Sevier County Soil Conservation District (SCD)

The SCD is a partner in the effort to reduce nonpoint source pollution to the local waters. The SCD can provide a significant amount of financial assistance to local water quality efforts. Through its direct interaction with the local NRCS district conservationist, the SCD can also direct technical as well as administrative assistance to local water quality projects. The SCD also serves as a leader in the effort to increase water quality education of the local citizens and operators.

Smoky Mountain RC&D Council

The local RC&D Council will manage the project as well as perform BMP implementation and public awareness. The RC&D's ability in these areas is important to the generation of projects now and in the future.

**3.5 TENNESSEE RIVER BASIN
FRENCH BROAD RIVER –
LITTLE PIGEON RIVER – EAST FORK/DUNN CREEK**



TVA-Resource Stewardship Watershed Team Program

TVA water quality professionals have the ability to generate local citizenry involvement while providing a beneficial level of water quality expertise. Water quality monitoring, as well as aerial photography landuse inventory capabilities from TVA, provide substantial technical support to this watershed effort. Moreover, TVA has the financial capability of funding ancillary projects, which could assist in promoting many of the needed BMPs for this specific watershed.

U.S. Army Corps of Engineers (USACE)

USACE has been active in the Nolichucky River watershed by initiating a Water Resources: Reconnaissance Study: Phase I [905(b)], based upon a local petition for the federal government to remedy the flooding problems, which have developed in the Little Pigeon River watershed due to development. USACE will partner with the City of Sevierville and Sevier County to complete this investigation into means of reducing stormwater discharge to Little Pigeon River.

CURRENT 319 PROJECTS

FY-2000 (UWA) French Broad River Water Quality Restoration Project:
Little Pigeon River-East Fork/Dunn Creek Sevier Co. SCD

CURRENT MONITORING & ASSESSMENT

TDEC-WPC five-year watershed management approach
TDH-DLS pre- and post- BMP monitoring

MEASURES OF SUCCESS

- UWA projects have been implemented in all 303(d) listed subwatersheds.
- Post BMP implementation monitoring results are indicating an overall improvement of the water quality of the streams directly affected by BMP implementation.
- The subwatersheds, once 303(d) listed, have been removed due to sufficient water quality improvements.

**3.5 TENNESSEE RIVER BASIN
FRENCH BROAD RIVER –
LITTLE PIGEON RIVER – EAST FORK/DUNN CREEK**



MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, strengthen existing partnerships and to foster greater trust, commitment and accountability.

- **Action:** Conduct an annual priority watershed partners meeting for project coordination.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDH-DLS; local governments
Year(s): 2001-2005
- **Action:** Develop a Watershed Restoration Action Strategy.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDEC-DWS-GWMS
Year(s): 2001

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- **Action:** Twenty percent of the needed BMPs will have been installed in the French Broad watershed.
Lead: USDA-NRCS; SCD and RC&D
Key Partners: TDA-NPS Program
Year(s): 2005
- **Action:** One hundred percent of the needed agricultural BMPs will have been implemented in the French Broad – Little Pigeon River – East Fork Dunn Creeks subwatersheds.
Lead: USDA-NRCS; RC&D; SCD
Key Partners: TDA-NPS Program
Year(s): 2005

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution.

- **Action:** Develop at least two educational projects to educate the local citizens, landowners, and elected officials in the French Broad – Little Pigeon River – East Fork Dunn Creeks subwatersheds.
Lead: TDA-NPS Program
Key Partner: TDEC-WPC; USDA-NRCS; SCD; TVA
Year(s): 2005

**3.5 TENNESSEE RIVER BASIN
FRENCH BROAD RIVER –
LITTLE PIGEON RIVER – EAST FORK/DUNN CREEK**



Long Term Goal 7.

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

- **Action:** One hundred percent of the pre-BMP implementation monitoring will have been completed in the French Broad – Little Pigeon River – East Fork Dunn Creek subwatersheds.
Lead: TDEC-WPC and TDH-DLS
Key Partners: TDA-NPS Program
Year(s): 2005
- **Action:** The water quality of the French Broad – Little Pigeon River – East Fork Dunn Creek subwatersheds will be improved.
Lead: TDEC-WPC
Key Partners: TDH-LDS and TDA-NPS Program
Year(s): 2005

3.6 TENNESSEE RIVER BASIN NOLICHUCKY RIVER



DESCRIPTION and EXTENT OF PROBLEM

According to the 1998 303(d) List, the following watersheds are impaired.

1998 303(d) LIST

WATERSHED NAME

Big Limestone Creek

Lick Creek

Pigeon Creek

Sinking Creek

Flat Creek

Meadow Creek

Dry Creek

SOURCES

nutrients/agriculture
suspended solids/agriculture
pathogens/agriculture
siltation/agriculture
nutrients/agriculture
pathogens/agriculture
pathogens/agriculture
siltation/agriculture
nutrients/agriculture
nutrients/siltation
pathogens
habitat alteration/siltation

SUBWATERSHED ROTATIONAL PLAN

The Nolichucky River subwatersheds are currently receiving EQIP rather than 319 funding. The possibility of addressing additional agricultural problems in these subwatersheds with 319 funding remains strong. As is common in most of the UWA watersheds, agricultural BMP activity is more advanced than other nonpoint source issues.

The watershed partners will be consulted and a subwatershed will be selected for a UWA project, in advance of the FY 2001 incremental grant work plan.

COOPERATING PARTNERS

Partners

Appalachian RC&D Council
Greene County government
Washington County government
Local landowners
Local soil conservation districts
Smoky Mt. RC&D Council
Tennessee Department of Agriculture
Ag Resources Conservation Program
Tennessee Department of Environment & Conservation
 Division of Water Pollution Control
 Division of Water Supply
 Ground Water Management Section
Tennessee Department of Health
 Division of Lab Services

Abbreviations

RC&D

SCDs
RC&D

TDA-ARC

TDEC-WPC

TDEC-DWS-GWMS

TDH-DLS

3.6 TENNESSEE RIVER BASIN NOLICHUCKY RIVER



Tennessee Parks & Greenways Foundation	TP&GF
Tennessee Wildlife Resource Agency	TWRA
Tennessee Valley Authority	TVA
Resource Stewardship Watershed Team Program	
U.S. Army Corps of Engineers	USACE
U.S. Department of Agriculture	
Natural Resource Conservation Service	USDA-NRCS
U.S. Department of Interior	
Fish & Wildlife Services	US F&WS
Geological Survey	USGS
U.T. Institute of Agriculture	UTIA
U.T. County Technical Assistance Service	UT-CTAS

Appalachian RC&D Council

The local RC&D Council will manage the project as well as BMP implementation and public awareness. The RC&Ds ability in these areas will be crucial to the generation of projects now and in the future.

Greene & Washington County governments

As Greene and Washington counties residential and commercial growth continues to take the remaining farmlands of the Nolichucky River watershed, its officials and residents will need to remain aware of and protect the existing Ag-related remediation work already in place. More importantly, government officials need to assume a leadership role in the nps effort by establishing water quality control measures for all construction sites and stormwater problem areas as growth continues.

Local landowners

Landowners will be requested to participate in the implementation of BMPs by allowing the BMP to be placed on their property, contributing to the construction of the BMP through in-kind services, and maintaining the BMP for a pre-determined or indefinite period of time. These same landowners will also be required to allow others to visit the BMP once it has been fully constructed.

Local Soil Conservation District (SCD)

The SCD is a partner in the effort to reduce nonpoint source pollution to the local waters. The SCD, as a primary state contractor, can provide a significant amount of financial assistance to local water quality efforts. Through its direct interaction with the local NRCS district conservationist, the SCD can also direct technical as well as administrative assistance to local water quality projects. The SCD also serves as a leader in the effort to increase water quality education of the local citizens and operators.

Smoky Mt. RC&D Council

The local RC&D Council will manage the project as well as BMP implementation and public awareness. The RC&Ds ability in these areas will be crucial to the generation of projects now and in the future.

3.6 TENNESSEE RIVER BASIN NOLICHUCKY RIVER



Tennessee Parks & Greenways Foundation

The Tennessee Parks & Greenways Foundation (TP&GF) is active in acquiring lands along streams throughout the state. By acquiring land along the streams, it can apply riparian restoration efforts to these areas, thereby providing water quality and habitat benefits to the stream. TP&GF has already acquired lands along streams in the Nolichucky River watershed and could be of assistance to local water quality partnerships.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers has completed a reconnaissance study in the Nolichucky River watershed to evaluate the presence of natural resources and what it would require to maintain and improve them. This kind of information would be very useful to any project that might occur in the watershed. The USACE also has the ability of initiating Water Resources: Reconnaissance Studies which could look into the remediation of flooding conditions through applying BMPs in the headwaters of the watershed.

USDA Natural Resources Conservation Service (NRCS)

The USDA-NRCS has two active Public Law 566 (Watershed Protection and Flood Prevention Act) water quality projects on-going in the Lick Creek and Big Limestone Creek watersheds in Greene and Washington counties. NRCS District Conservationists and the local SCDs are contracting with private landowners to apply BMPs to address sedimentation, nutrient loading, and bacteria concerns on agricultural land.

CURRENT 319 PROJECTS

FY-96	Nolichucky River Pesticide Awareness Project	App. RC&D
-------	----------------------------------------------	-----------

CURRENT MONITORING & ASSESSMENT

TDEC-WPC five-year watershed management approach
TDH-DLS pre- and post- BMP monitoring

MEASURES OF SUCCESS

- UWA projects have been implemented in all 303(d) listed subwatersheds with a large portion of the required pollutant source sites having been addressed.
- Post BMP implementation monitoring results are indicating an overall improvement of the water quality of the streams directly affected by BMP implementation.
- The subwatersheds once 303(d) listed have been removed due to sufficient water quality improvements.

**3.6 TENNESSEE RIVER BASIN
NOLICHUCKY RIVER**



MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, strengthen existing partnerships and to foster greater trust, commitment and accountability.

- **Action:** Conduct an annual priority watershed partners meeting for project coordination.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDH-DLS; local governments
Year(s): 2001-2005
- **Action:** Develop a Watershed Restoration Action Strategy.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDEC-DWS-GWMS
Year(s): 2001

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- **Action:** Twenty percent of the needed BMPs will have been installed in the Nolichucky River watershed.
Lead: USDA-NRCS; SCD and RC&D
Key Partners: TDA-NPS Program
Year(s): 2005
- **Action:** One hundred percent of the needed agricultural BMPs will have been implemented in the Nolichucky River subwatersheds.
Lead: USDA-NRCS; RC&D; SCD
Key Partners: TDA-NPS Program
Year(s): 2005

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution.

- **Action:** Develop at least two educational projects to educate the local citizens, landowners, and elected officials in the Nolichucky River subwatersheds.
Lead: TDA-NPS Program
Key Partner: TDEC-WPC; USDA-NRCS; SCD; TVA
Year(s): 2005

**3.6 TENNESSEE RIVER BASIN
NOLICHUCKY RIVER**



Long Term Goal 7.

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

- **Action:** One hundred percent of the pre-BMP implementation monitoring will have been completed in the Nolichucky River subwatersheds.
Lead: TDEC-WPC and TDH-DLS
Key Partners: TDA-NPS Program
Year(s): 2005
- **Action:** The water quality of the Nolichucky River subwatersheds will be improved.
Lead: TDEC-WPC
Key Partners: TDH-LDS and TDA-NPS Program
Year(s): 2005

3.7 TENNESSEE RIVER BASIN LITTLE RIVER – ELLEJOY CREEK



DESCRIPTION and EXTENT OF PROBLEM

According to the 1998 303(d) List, more than 97 miles are partially supporting and more than 70 miles are not supporting of the Little River watershed due to sediment and nutrient loadings, organic enrichment, and habitat alteration caused by agriculture and land development activities. In the Little River – Ellejoy Creek subwatershed, agriculture is the major source of impairment, with construction ranking second.

1998 303(d) LIST WATERSHED NAME

Ellejoy Creek
Crooked Creek
Pistol Creek
Stock Creek
Short Creek

SOURCES

agriculture & land development
pasture & failing septic systems
agriculture/land development & urban runoff
agriculture & failing septic systems
construction

SUBWATERSHED ROTATIONAL PLAN

The Little River – Ellejoy Creek subwatershed is currently receiving 319 funding through a FY-99 UWA grant. The Ellejoy Creek subwatershed was selected because of its agricultural predominance. As the FY-99 UWA grant progresses the project manager, Blount County SCD, will be able to determine, with assistance from TDEC, which Little River subwatershed should be addressed next with UWA funding. As is common in most of the UWA watersheds agricultural BMP activity is more advanced than other nonpoint source issues. Yet, time should demonstrate a growing level of expertise in the other nonpoint source issues (i.e. land development, failing septic systems, and urban runoff), thereby allowing other 303(d) listed subwatersheds, which are less agriculturally oriented, to be addressed with UWA funds.

The next watershed to be addressed with UWA funds could be Crooked Fork. This subwatershed is more diverse in its nonpoint source issues. As failing septic systems and construction issues are better understood by local partners, which is being initiated by another 319 project addressing urban runoff issues in this watershed, the likelihood of these subwatersheds being successfully treated increases. Once these subwatersheds, along with Pistol Creek, have been addressed with sufficient BMP implementation they should have a good chance of being removed from the 303(d) List.

COOPERATING PARTNERS

Partners

Blount County government
Blount County Soil Conservation District
City of Alcoa
City of Maryville
Keep Blount Beautiful
Local developers & home builders
Local landowners

Abbreviations

SCD

3.7 TENNESSEE RIVER BASIN LITTLE RIVER – ELLEJOY CREEK



Smoky Mountain RC&D Council	RC&D
Tennessee Department of Agriculture	
Ag Resources Conservation Program	TDA-ARC
Tennessee Department of Environment & Conservation	
Division of Ground Water Protection	TDEC-GWP
Division of Water Pollution Control	TDEC-WPC
Division of Water Supply	
Ground Water Management Section	TDEC-DWS-GWMS
Tennessee Department of Health	
Division of Lab Services	TDH-DLS
Tennessee Home Builders Association	THBA
Tennessee Valley Authority	TVA
Resource Stewardship Watershed Team Program	
U.S. Department of Agriculture	
Natural Resource Conservation Service	USDA-NRCS
U.T. Institute of Agriculture	UTIA
U.T. County Technical Assistance Service	UT-CTAS

Blount County government

As Blount County residential and commercial growth continues to take the remaining farmlands of the Little River-Ellejoy Creek watershed, its officials and residents will need to remain aware of and protect the existing Ag-related remediation work already in place. More importantly, government officials need to assume a leadership role in the nonpoint source effort by establishing water quality control measures for all construction sites and stormwater problem areas as growth continues.

Blount County Soil Conservation District

The SCD is a partner in the effort to reduce nonpoint source pollution to the local waters. The SCD, as a primary state contractor, can provide a significant amount of financial assistance to local water quality efforts. Through its direct interaction with the local NRCS district conservationist, the SCD can also direct technical as well as administrative assistance to local water quality projects. The SCD also serves as a leader in the effort to increase water quality education of the local citizens and operators.

Cities of Alcoa & Maryville

City officials will be encouraged to work with local landowners and contractors to, at least, investigate the possibilities of installing BMPs to reduce construction and urban-related runoff. Even though initial BMPs implemented in the watershed will be of an agricultural nature, the city officials, landowners, and contractors will be provided an opportunity to learn how these BMPs can be converted to more urbanized uses. By doing so, the city will be better informed and will be more likely to participate in subsequent water quality abatement and remediation efforts.

Keep Blount Beautiful

Keep Blount Beautiful (KBB) is a local chapter of the national Keep America Beautiful program. KBB has completed a successful illegal dumpsite cleanup program where it not only inventoried all of the illegal dumpsites in the county, but also corrected them. It

3.7 TENNESSEE RIVER BASIN LITTLE RIVER – ELLEJOY CREEK



has kept the initiation of new illegal dumpsites to a minimum in the face of higher landfill tipping fees.

This type of success is based upon strong local citizens support. KBB would be a partner for future watershed efforts because of its strong environmental stewardship and its ability to promote local support through public awareness campaigns.

Local developers & home builders

Blount County is rapidly growing with many rural areas becoming sub-urbanized. Agricultural-related problems are giving way to construction and urban runoff problems, an issue, which can be minimized if developers, contractors, and home builders make the concerted effort to eliminate sediment loadings and high stormwater discharges. The TDA-NPS Program has coordinated with local officials, through a FY-99 grant project to introduce nonpoint source technologies to the area.

Local landowners

Landowners will be requested to participate in the implementation of BMPs by allowing the BMP to be placed on their property, contributing to the construction of the BMP through in-kind services, and maintaining the BMP for a pre-determined or indefinite period of time. These same landowners will also be required to allow others to visit the BMP once it has been fully constructed.

Smoky Mountain RC&D Council

The local RC&D Council will manage the project as well as BMP implementation, and public awareness. The RC&D's ability in these areas will be crucial to the generation of projects now and in the future.

CURRENT 319 PROJECTS

FY-99	Lambert Estates STEP Sewer System Project	City of Maryville
FY-99(UWA)	Little River Water Quality Restoration Project: Ellejoy Cr.	BCSCD

CURRENT MONITORING & ASSESSMENT

TDEC-WPC five-year watershed management approach
TDH-DLS pre- and post- BMP monitoring

MEASURES OF SUCCESS

- UWA projects have been implemented in all 303(d) listed subwatersheds with a large portion of the required pollutant source sites having been addressed.
- Post BMP implementation monitoring results are indicating an overall improvement of the water quality of the streams directly affected by BMP implementation.
- The subwatersheds once 303(d) listed have been removed due to sufficient water quality improvements.

3.7 TENNESSEE RIVER BASIN LITTLE RIVER – ELLEJOY CREEK



MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, strengthen existing partnerships and to foster greater trust, commitment and accountability.

- **Action:** Conduct an annual priority watershed partners meeting for project coordination.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; RC&D; SCDs; TVA; local governments
Year(s): 2001-2005
- **Action:** Develop a Watershed Restoration Action Strategy.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDEC-DWS-GWMS
Year(s): 2001

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- **Action:** 100% of the needed agricultural BMPs will have be implemented in the Little River-Ellejoy Creek.
Lead: USDA-NRCS; RC&D; SCDs; TVA; local governments
Key Partners: TDA-NPS Program TDEC-WPC
Year(s): 2005
- **Action:** 60% of the needed agricultural, septic systems, and construction BMPs will be implemented in the Little River watershed.
Lead: USDA-NRCS; RC&D; SCDs; TVA; local governments
Key Partners: TDA-NPS Program TDEC-WPC
Year(s): 2010

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution.

- **Action:** Develop at least two educational projects to educate the local citizens, landowners, and elected officials in the Little River-Ellejoy Creek subwatershed.
Lead: TDA-NPS Program
Key Partner: RC&D; USDA-NRCS; SCDs and TVA
Year(s): 2005

3.7 TENNESSEE RIVER BASIN
LITTLE RIVER – ELLEJOY CREEK



Long Term Goal 7.

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

- **Action:** Pre-BMP implementation monitoring will have been completed and post-BMP implementation monitoring will be in progress in the Little River-Ellejoy Creek subwatershed.
Lead: TDEC-WPC and TDH-DLS
Key Partners: TDA-NPS Program, USDA-NRCS
Year(s): 2002
- Action:** Post-BMP implementation monitoring will have been completed in the Little River- Ellejoy Creek subwatershed.
Lead: TDEC-WPC and TDH-DLS
Key Partners: TDA-NPS Program, USDA-NRCS
Year(s): 2005
- **Action:** 100% of the Little River – Ellejoy Creek subwatershed will be fully supporting its designated uses.
Lead: TDEC-WPC and TDH-DLS
Key Partners: RC&D; SCDs; USDA-NRCS; TVA;TDA-NPS Program
Year(s): 2005
- **Action:** 20% of the Little River watershed will be fully supporting its designated uses.
Lead: TDEC-WPC and TDH-DLS
Key Partners: RC&D; SCDs; USDA-NRCS; TVA;TDA-NPS Program
Year(s): 2010

3.8 TENNESSEE RIVER BASIN**CLINCH RIVER – SWAN ISLAND & BRIAR CREEKS****DESCRIPTION and EXTENT OF PROBLEM**

Many shoals are found in the first 40 miles of the Clinch River in Tennessee. The shallow waters surrounding these shoals provide habitat for a wide range of aquatic life, including many endangered mussel and fish species. The Nature Conservancy has ranked this reach of the Clinch River as having more imperiled species than anywhere else in North America, making it a unique natural resource.

WATERSHED NAME**SOURCES**

[none of these watersheds are 303(d) listed – the following text is based upon observations made by local water quality specialists]

Clinch River mainstem/shoals
Swan Island Creek
Briar Creek

agriculture
agriculture
agriculture

SUBWATERSHED ROTATIONAL PLAN

A three-mile reach of the Clinch River immediately upstream from and including Swan Island shoal is receiving 319 funding through an FY-99 UWA grant. This reach is predominantly agricultural in nature. As this FY-99 project progresses the project manager, Clinch-Powell RC&D Council, will be able to determine, with assistance from TDEC and the watershed technical team, which watershed should be addressed next with UWA funding. The next watershed to be addressed with UWA funds would likely be close to another endangered shoal.

At this time, agriculture is the only nonpoint source issue addressed in the watershed. Other nonpoint source sources will be corrected, if they are found in the watershed.

COOPERATING PARTNERS**Partners****Abbreviations**

City of Sneedville
Clinch-Powell RC&D Council
Hancock County Soil Conservation District
Hancock County government
Lincoln Memorial University
Department of Biology
Local landowners
The Nature Conservancy-Virginia
Clinch Valley Bioreserve
Tennessee Department of Agriculture
Ag Resources Conservation Program
Tennessee Department of Environment & Conservation
Division of Water Pollution Control
Tennessee Valley Authority

RC&D
SCD

LMU

TNC-VA
CVB

TDA-ARC

TDEC-WPC
TVA

3.8 TENNESSEE RIVER BASIN

CLINCH RIVER – SWAN ISLAND & BRIAR CREEKS



Resource Stewardship Watershed Team Program	
Tennessee Wildlife Resource Agency	TWRA
U.S. Department of Agriculture	
Natural Resources Conservation Service	USDA-NRCS
U.S. Department of Interior	USDI
Fish & Wildlife Service	F&WS
Geological Survey	USGS
U.T. Institute of Agriculture	UTIA
U.T.-County Technical Assistance Service	UT-CTAS

City of Sneedville

City officials will be encouraged to work with local landowners and contractors to at least investigate the possibilities of installing BMPs to reduce construction and urban-related runoff.

Clinch-Powell RC&D Council

The local RC&D Council will manage the project as well as BMP implementation, and public awareness. The RC&D's ability in these areas will be crucial to the generation of projects now and in the future.

Hancock County Soil Conservation District

The SCD is a partner in the effort to reduce nonpoint source pollution to local waters. The SCD, can provide a significant amount of financial assistance to local water quality efforts. Through its direct interaction with the local NRCS district conservationist, the SCD can also direct technical, as well as administrative, assistance to local water quality projects. The SCD also serves as a leader in the effort to increase water quality education of the local citizens and operators.

Hancock County government

As residential and commercial growth begins to escalate in the Clinch River watershed due to the impact of US 25E expansion, its officials will need to remain aware of and protect the existing Ag-related remediation work already in place. More importantly, government officials need to assume a leadership role in the nonpoint source effort by establishing water quality control measures for all construction sites and stormwater problem areas as growth continues.

LMU-Department of Biology

Lincoln Memorial University is a college located not far from the Clinch and Powell Rivers. LMUs biology department has been monitoring many of the receiving streams in the area and have volunteered to partner with TNC, TVA, TWRA, and USGS in an effort to provide the biological and chemical monitoring in the Upper Clinch River watershed project.

Local landowners

Landowners will be requested to participate in the implementation of BMPs by allowing the BMP to be placed on their property, contributing to the construction of the BMP through in-kind services, and maintaining the BMP for a pre-determined or indefinite

3.8 TENNESSEE RIVER BASIN

CLINCH RIVER – SWAN ISLAND & BRIAR CREEKS



period of time. These same landowners will also be required to allow others to visit the BMP once it has been fully constructed.

TNC-Virginia: Clinch Valley Bioreserve

TNC-Virginia staff is currently positioned in the Clinch River watershed to carry out such projects and could serve as an excellent partner. TNC's ability to purchase lands could be well served along riparian zones of the Upper Clinch River and its tributaries in an effort to improve the water quality. Staff of TNC-Virginia have volunteered to assist in the writing of the Quality Assurance Protection Plan for the Clinch River – Briar and Swan Island Creek watershed project. TNC, along with LMU, TVA, TWRA, and USGS will partner to produce the biological and chemical monitoring associated with the watershed project.

CURRENT 319 PROJECTS

FY-93	Clinch-Powell Rivers Interstate NPS W'shed Demo. Proj.	C-P RC&D
FY-95	Upper Clinch River Riparian Restoration & Erosion Control	TNC
FY-97	Remediation of Open Illegal Dumps in Clinch & Powell R.	C-P RC&D
FY-99(UWA)	Clinch R. Water Quality Restoration Project: Briar/Swan	C-P RC&D

CURRENT MONITORING & ASSESSMENT

TDEC-WPC five-year watershed management approach
 TDH-DLS pre- and post- BMP monitoring
 LMU monitoring
 TWRA monitoring
 TVA monitoring
 USGS monitoring

MEASURES OF SUCCESS

- UWA projects have been implemented in all 303(d) listed subwatersheds with a large portion of the required pollutant source sites having been addressed.
- Streambank stabilization BMPs have been sufficiently demonstrated to promote the projected implementation of these BMPs where needed throughout the watershed.
- Post BMP implementation monitoring results are indicating an overall improvement of the water quality of the streams directly affected by BMP implementation.

3.8 TENNESSEE RIVER BASIN

CLINCH RIVER – SWAN ISLAND & BRIAR CREEKS



MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, strengthen existing partnerships and to foster greater trust, commitment and accountability.

- **Action:** Conduct an annual priority watershed partners meeting for project coordination.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; RC&D; TVA; SCDs; local governments
Year(s): 2001-2005
- **Action:** Develop a Watershed Restoration Action Strategy.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDEC-DWS-GWMS
Year(s): 2001

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- **Action:** 100% of the needed agricultural BMPs will have been implemented in the Clinch River – Swan Island/Briar Creek subwatersheds.
Lead: RC&D, SCD
Key Partners: TDA-NPS Program; TVA; TNC
Year(s): 2005
- **Action:** 20% of the needed agricultural BMPs will have been implemented in the Clinch River watershed.
Lead: RC&D, SCD,
Key Partners: TDA-NPS Program; TVA; TNC
Year(s): 2010

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution.

- **Action:** Develop at least two educational projects to educate the local citizens, landowners, and elected officials in the Clinch River- Island and Briar Creek subwatersheds.
Lead: TDA-NPS Program
Key Partner: RC&D; TNC; TVA
Year(s): 2005

3.8 TENNESSEE RIVER BASIN

CLINCH RIVER – SWAN ISLAND & BRIAR CREEKS



Long Term Goal 7.

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

- **Action:** pre-BMP implementation monitoring will have been completed in all of the Clinch River subwatersheds.
Lead: TDEC-WPC; TDH-DLS
Key Partners: USGS; TVA; TWRA; TDA-NPS Program
Year(s): 2005
- **Action:** 100% of the Clinch River – Swan Island/Briar Creek subwatersheds will be trending towards fully supporting its designated uses.
Lead: RC&D, TVA, SCDs
Key Partners: USGS; TVA; TWRA; TDA-NPS Program
Year(s): 2005



DESCRIPTION and EXTENT OF PROBLEM

According to the 1998 303(d) List, more than 11 miles are partially supporting and more than 113 miles are not supporting in the Hiwassee River watershed due to high levels of pathogens and suspended solids caused by agricultural and urban activities. The initial targeted UWA watershed, Hiwassee River – upper reach of Oostanaula Creek subwatershed, will be focusing on pastureland and animal holding areas. Urban runoff, land disposal (failing septic systems), hydrologic modification (streambank stabilization) and construction (land development) will be added as other subwatersheds are addressed.

1998 303(d) LIST

WATERSHED NAME

Oostanaula Creek (upper)
Oostanaula Creek (lower)
North Mouse Creek
Cane Creek

SOURCES

agriculture
agriculture/urban runoff
agriculture
failing septic systems/pasturelands

SUBWATERSHED ROTATIONAL PLAN

The upper reach of Hiwassee River - Oostanaula Creek watershed will receive 319 funding through the FY-00 UWA grant. The upper reach of Oostanaula Creek subwatershed was selected because of its agricultural predominance. As the FY-00 grant progresses, the project manager, S.E. Tennessee RC&D Council, will be able to determine, with assistance from TDEC and the local technical team, which Hiwassee River subwatershed should be addressed next with UWA funding. As is common in most of the UWA watersheds, agricultural BMP activity is more advanced than other nonpoint source issues. Yet, time should demonstrate a growing level of expertise in the other nonpoint source issues, thereby allowing other subwatersheds which are less agriculturally oriented (i.e. lower reach of Oostanaula Creek) to be addressed with UWA funds.

It is important to note that while these UWA efforts are on going, the base grants will also be funding demonstration BMPs and public awareness efforts throughout the watershed. These efforts will address failing septic systems, construction, and urban runoff issues.

The next watershed to be addressed with UWA funds will be either of the predominantly agricultural North Mouse Creek or Cane Creek subwatersheds. As urban runoff and construction issues are better understood by local partners subwatersheds like the more urbanized lower reach of Oostanaula Creek would then be addressed. Once all of these subwatersheds have been addressed with sufficient BMP implementation efforts, Hiwassee River would likely be removed from the 303(d) List.



COOPERATING PARTNERS

Partners

City of Athens
 Local developers & home builders
 Local landowners
 McMinn County government
 Monroe County government
 McMinn County Soil Conservation District
 Monroe County Soil Conservation District
 SE TN RC&D Council
 Tennessee Department of Agriculture
 Ag Resources Conservation Program
 Tennessee Department of Environment & Conservation
 Division of Ground Water Protection
 Division of Water Pollution Control
 Division of Water Supply
 Tennessee Department of Health
 Division of Lab Services
 Tennessee Home Builders Association
 Tennessee Valley Authority
 Resource Stewardship Watershed Team Program
 U.S. Department of Agriculture
 Natural Resource Conservation Service
 U.T. Institute of Agriculture
 U.T. County Technical Assistance Service

Abbreviations

SCD
 SCD
 RC&D

 TDA-ARC

 TDEC-GWP
 TDEC-WPC
 TDEC-DWS

 TDH-DLS
 THBA
 TVA

 USDA-NRCS
 UTIA
 UT-CTAS

Local developers & home builders

The Athens area of McMinn County is growing with many rural areas becoming sub-urbanized. Agricultural-related problems are giving way to construction and urban runoff problems, an issue, which can be minimized if developers, contractors, and home builders make the effort to eliminate sediment loadings and high stormwater discharges.

Local landowners

Landowners will be requested to participate in the implementation of BMPs by allowing the BMP to be placed on their property, contributing to the construction of the BMP through in-kind services, and maintaining the BMP for a pre-determined or indefinite period of time. These same landowners will also be required to allow others to visit the BMP once it has been fully constructed.

Local Governments

As residential and commercial growth continues to take farmland of the Hiwassee River-Oostanaula Creek watershed in McMinn and Monroe Counties, their officials and residents will need to remain aware of and protect the existing Ag-related remediation work already in place. Government officials need to assume a leadership role in the nonpoint source effort by establishing water quality control measures for all construction sites and stormwater problem areas as growth continues.



City officials will be encouraged to work with local landowners and contractors to at least investigate the possibilities of installing BMPs to reduce construction and urban-related runoff. Even though initial BMPs implemented in the watershed will be of an agricultural nature, the city officials, landowners, and contractors will be provided an opportunity to learn how these BMPs can be converted to more urbanized usage.

McMinn & Monroe County Soil Conservation Districts

The SCDs are an active partner in the effort to reduce nonpoint source pollution to local waters. The SCDs can provide a significant amount of financial assistance to local water quality efforts. Through their direct interaction with the local NRCS district conservationist, the SCDs can also direct technical as well as administrative assistance to local water quality projects. The SCDs also serve as leaders in the effort to increase water quality education of the local citizens and operators.

RC&D Council

The local RC&D Council will manage the project as well as BMP implementation and public awareness. The RC&D's ability in these areas will be crucial to the generation of projects now and in the future.

CURRENT 319 PROJECTS

FY-2000(UWA) Hiwassee River Water Quality Restoration Project: Oostanaula Cr.
RC&D

CURRENT MONITORING & ASSESSMENT

TDEC-WPC five-year watershed management approach
TDH-DLS pre- and post- BMP monitoring

MEASURES OF SUCCESS

- UWA projects have been implemented in all 303(d) listed subwatersheds with a large portion of the required pollutant source sites having been addressed.
- Post BMP implementation monitoring results are indicating an overall improvement of the water quality of the streams directly affected by BMP implementation.
- The subwatersheds once 303(d) listed have been removed due to sufficient water quality improvements.



MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, strengthen existing partnerships and to foster greater trust, commitment and accountability.

- **Action:** Conduct an annual priority watershed partners meeting for project coordination.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDH-DLS; USDI-BISO; local governments
Year(s): 2001-2005
- **Action:** Develop a Watershed Restoration Action Strategy.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDEC-DWS-GWMS
Year(s): 2001

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- **Action:** 100% of the needed agricultural BMPs will be completed in the Hiwassee River – upper Oostanaula Creek subwatershed.
Lead: RC&D, SCDs, USDA-NRCS
Key Partners: TVA; TDA-NPS Program
Year(s): 2005
- **Action:** 60% of the needed agricultural, septic system, and construction BMPs will have been completed in the Hiwassee River watershed.
Lead: RC&D, SCDs, USDA-NRCS
Key Partners: TVA; TDA-NPS Program
Year(s): 2010

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution.

- **Action:** Develop at least two educational projects to educate the local citizens, landowners, and elected officials in the Hiwassee River- Oostanaula subwatershed.
Lead: TDA-NPS Program
Key Partner: TDEC-WPC; USDA-NRCS and RC&D; SCDs; TVA
Year(s): 2005



Long Term Goal 7.

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

- **Action:** Pre-BMP implementation monitoring will have been completed in 100% of the Hiwassee River subwatersheds, while post-BMP implementation monitoring will have been completed in the Hiwassee River – upper Oostanaula Creek subwatershed.
Lead: TDEC-WPC; TDH-DLS
Key Partners: TDA-NPS Program; RC&D; TVA
Year(s): 2005
- **Action:** 60% of the post-BMP implementation monitoring will have been completed in the Hiwassee River watershed.
Lead: TDEC-WPC; TDH-DLS
Key Partners: TDA-NPS Program; RC&D; TVA
Year(s): 2010
- **Action:** 100% of the Hiwassee River-upper Oostanaula Creek subwatershed will be trending to fully supporting its designated uses.
Lead: TDEC-WPC; TDH-DLS
Key Partners: TDA-NPS Program; RC&D; TVA
Year(s): 2005

3.10 TENNESSEE RIVER BASIN UPPER DUCK RIVER



DESCRIPTION and EXTENT OF PROBLEM

According to the 1998 303(d) List, several subwatersheds of the Upper Duck River are either partially or not supporting due to high levels of pathogens, nutrients, and sediment caused by agriculture (pasturelands & animal holding areas), urban runoff, land disposal (failing septic systems), and construction (land development).

1998 303(d) LIST

WATERSHED NAME

Upper Duck River-Cathey's Creek
Upper Duck River-Caney Creek
Upper Duck River-Fall Creek
Upper Duck River-North Fork Creek
Upper Duck River-Wartrace Creek

SOURCES

agriculture
pastureland
agriculture
agriculture
pastureland

SUBWATERSHED ROTATIONAL PLAN

The Upper Duck River subwatersheds are currently not receiving any 319 or EQIP funding. The possibility of addressing additional agricultural problems in the subwatersheds with 319 funding remains strong. As is common in most of the UWA watersheds agricultural BMP activity is more advanced than other nps issues. If it is deemed by TDEC that other sources require remediation, time should demonstrate a growing level of expertise in the other nps issues, thereby allowing these other sources to be addressed with 319 funds in these same subwatersheds.

COOPERATING PARTNERS

Partners

Duck River Agency
Keep America Beautiful chapters
Keep Tennessee Beautiful program
Local city governments
Local county governments
Local county Soil Conservation Districts
Local developers & home builders
Local landowners
Tennessee Department of Agriculture
 Ag Resources Conservation Program
Tennessee Department of Environment & Conservation
 Division of Ground Water Protection
 Division of Solid Waste Management
 Division of Water Pollution Control
 Division of Water Supply
Tennessee Department of Health
 Division of Lab Services
Tennessee Valley Authority
 Resource Stewardship Watershed Team Program

Abbreviations

DRA
KAB
KTB

SCDs

TDA-ARC

TDEC-GWP
TDEC-SWM
TDEC-WPC
TDEC-DWS

TDH-DLS
TVA

**3.10 TENNESSEE RIVER BASIN
UPPER DUCK RIVER**



Tennessee Home Builders Association	THBA
Science Applications International Corporation	SAIC
The Nature Conservancy – Tennessee	TNC
U.S. Department of Agriculture Natural Resource Conservation Service	USDA-NRCS
U.S. Department of Interior Geological Survey	USGS
U.T. Institute of Agriculture	UTIA
U.T. County Technical Assistance Service	UT-CTAS

Duck River Agency

The agency has been the recipient of low altitude infrared imagery mapping completed by TVA and supported through 319 funds. This mapping will serve as an important guide to land usage in the watershed, thereby providing insight as to where and what type BMPs need to be implemented in order to improve local water quality.

The DRA has had close ties with the Duck River Utility Commission, which provides the majority of drinking water from the Normandy Lake. Through both of these entities, public awareness efforts could be launched in an effort to increase local water quality stewardship and public support.

Keep Tennessee Beautiful Program: Keep America Beautiful

Several local chapters of the national Keep America Beautiful program are active in the Duck River watershed. These chapters have the opportunity of participating in a 319-funded illegal dumpsite cleanup program, managed by the Keep Tennessee Beautiful Program. This project will inventory all of the illegal dumpsites in a five county area and facilitate the remediation of at least one site in each of these counties.

This type of success will be dependent upon strong local citizens support. These chapters would be excellent partners for future watershed efforts because of their strong environmental stewardship and their abilities to promote local support through public awareness campaigns.

Local Governments

As Coffee and Bedford Counties' residential and commercial growth continues to take farmland of the Upper Duck River watershed, its officials and residents will need to remain aware of and protect the existing Ag-related remediation work already in place. More importantly, government officials need to assume a leadership role in the nonpoint source effort by establishing water quality control measures for all construction sites and stormwater problem areas as growth continues.

City officials will be encouraged to work with local landowners and contractors to at least investigate the possibilities of installing BMPs to reduce construction and urban-related runoff. Even though initial BMPs implemented in the watershed will be of an agricultural nature, the city officials, landowners, and contractors will be provided an opportunity to learn how these BMPs can be converted to more urbanized usage.

**3.10 TENNESSEE RIVER BASIN
UPPER DUCK RIVER**



Local County Soil Conservation Districts

The SCDs are partners in the effort to reduce nonpoint source pollution to the local waters. They can provide a significant amount of financial assistance to local water quality efforts. Through their direct interaction with the local NRCS district conservationist, the SCDs can also direct technical as well as administrative assistance to local water quality projects. The SCDs also serve as leaders in the effort to increase water quality education of the local citizens and operators.

Local developers & home builders

The local watersheds are rapidly growing with many rural areas becoming sub-urbanized. Agricultural-related problems are giving way to construction and urban runoff problems, an issue, which can be minimized if developers, contractors, and home builders make the effort to eliminate sediment loadings and high stormwater discharges.

Local landowners

Landowners will be requested to participate in the implementation of BMPs by allowing the BMP to be placed on their property, contributing to the construction of the BMP through in-kind services, and maintaining the BMP for a pre-determined or indefinite period of time. These same landowners will also be required to allow others to visit the BMP once it has been fully constructed.

TDEC-Division of Solid Waste Management

The Division of Solid Waste Management (SWM) can work with the Keep America Beautiful chapters and the Keep Tennessee Beautiful program by providing them with amnesty for lands containing existing illegal dumpsites. This will allow the landowners to give chapter members access to the existing illegal dumpsites without the fear of being cited by TDEC-SWM or TDEC-WPC. SWM would also have the opportunity of exchanging information with the chapters regarding water quality prioritization and techniques for collecting and disposing of solid waste collected at illegal dumpsites.

Science Applications International Corporation

Science Applications International Corporation (SAIC) is currently involved in both surface and ground water quality issues at the Arnold (Air Force) Engineering Development Center (AEDC), located in the upper reaches of the Upper Duck River watershed. Staff could provide stormwater management and soil erosion assistance to local entities during a future Upper Duck River watershed project.

The Nature Conservancy – Tennessee

The Nature Conservancy (TNC) is known worldwide for its ability to purchase lands in an effort to protect natural resources including water quality. TNC staff is currently positioned in the Duck River watershed to carry out such projects and will serve as an excellent partner. TNC's ability to purchase lands could be well served along riparian zones of the Upper Duck River and its tributaries in an effort to improve the water quality and local ecology.



CURRENT 319 PROJECTS

FY-96 Normandy Lake Improvement Through Watershedwide Mgmt. DRA/TVA

CURRENT MONITORING & ASSESSMENT

TDEC-WPC five-year watershed management approach
TDH-DLS pre- and post- BMP monitoring

MEASURES OF SUCCESS

- UWA projects have been implemented in all 303(d) listed subwatersheds with a large portion of the required pollutant source sites having been addressed.
- Base projects have been implemented in all 303(d) listed subwatersheds, which require the introduction of un-addressed nps categories (i.e. failing septic systems, construction, and urban runoff) through demonstration projects.
- Post BMP implementation monitoring results are indicating an overall improvement of the water quality of the streams directly affected by BMP implementation.
- The subwatersheds once 303(d) listed have been removed due to sufficient water quality improvements.
- BMP implementation has improved the water quality to the point that the health and quantities of natural resources, including endangered habitat and aquatic life, have significantly improved.

MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, strengthen existing partnerships and to foster greater trust, commitment and accountability.

- **Action:** Conduct an annual priority watershed partners meeting for project coordination.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDH-DLS; TVA; local governments;SCDs; TNC
Year(s): 2001-2005
- **Action:** Select the initial subwatershed for restoration.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDH-DLS; TVA; local governments;SCDs; TNC
Year(s): 2001

3.10 TENNESSEE RIVER BASIN UPPER DUCK RIVER



- **Action:** Develop a Watershed Restoration Action Strategy.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDEC-DWS-GWMS
Year(s): 2001

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- Action:** All needed BMPs will be installed in the selected subwatershed.
Lead: SCDs; TVA; TNC;USDA-NRCS
Key Partner: TDA-NPS Program
Year(s): 2005

- Action:** Forty percent of the needed BMPs in the Upper Duck watershed will be implemented.
Lead: SCDs; TVA; TNC;USDA-NRCS
Key Partner: TDA-NPS Program
Year(s): 2010

- **Action:** Water quality of the selected subwatershed will indicate improvement due to the BMP implementation efforts.
Lead: TDEC-WPC and TDH-DLS
Key Partners: TVA; USDA-NRCS; SCDs
Year(s): 2005

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution.

- **Action:** Develop at least two educational projects to educate the local citizens, landowners, and elected officials in the Upper Duck River Watershed
Lead: TDA-NPS Program
Key Partner: SCDs; USDA-NRCS; TNC; TVA
Year(s): 2005

Long Term Goal 7.

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

- **Action:** Pre-BMP implementation monitoring will have been completed and post-BMP implementation monitoring will be in progress in the selected subwatersheds of the Upper Duck watershed
Lead: TDEC-WPC and TDH-DLS
Key Partners: TDA-NPS Program, USDA-NRCS; SCDs; TVA
Year(s): 2005

**3.10 TENNESSEE RIVER BASIN
UPPER DUCK RIVER**



- **Action:** Post-BMP implementation monitoring will have been completed in two subwatersheds of the Upper Duck watershed.
Lead: TDEC-WPC and TDH-DLS
Key Partners: TDA-NPS Program, USDA-NRCS
Year(s): 2010

**3.11 MISSISSIPPI RIVER BASIN
HATCHIE RIVER – TUSCUMBIA RIVER
CYPRESS CREEK – MUDDY CREEK**



DESCRIPTION and EXTENT OF PROBLEM

According to the 1998 303(d) List, more than 318 miles of the Hatchie River – Cypress Creek subwatershed are partially supporting due to the siltation caused by agricultural practices. Agriculture will be the major cause of water pollution addressed in the initial UWA-targeted subwatersheds, Cypress Creek – Muddy Creek.

1998 303(d) LIST

WATERSHED NAME

Cypress Creek-Muddy Creek

SOURCES

siltation/agriculture

SUBWATERSHED ROTATIONAL PLAN

The Cypress Creek watershed will receive 319 funding through the FY-00 UWA grant. The watershed was selected because of their agricultural predominance. As the FY-00 grant progresses the project manager, Chickasaw-Shiloh RC&D, will be able to determine, with assistance from TDEC, which would be the next subwatershed needing UWA funding. Several other subwatersheds of the Cypress Creek watershed are in need of remediative efforts. As is common in most of the UWA watersheds agricultural BMP activity is more advanced than other nonpoint source issues.

It is important to note that while these UWA efforts are on going the base grants will also be funding demonstration BMPs and public awareness efforts throughout the watershed. These efforts will address failing septic systems.

COOPERATING PARTNERS

Partners

Chickasaw-Shiloh RC&D Council
Local landowners
McNairy County Soil Conservation District
McNairy County government
Tennessee Department of Agriculture
 Ag Resources Conservation Program
Tennessee Department of Environment & Conservation
 Division of Ground Water Protection
 Division of Water Pollution Control
 Division of Water Supply
 Ground Water Management Section
Tennessee Department of Health
 Division of Lab Services
U.S. Department of Agriculture
 Natural Resource Conservation Service
U.T. Institute of Agriculture

Abbreviations

RC&D

SCD

TDA-ARC

TDEC-GWP
TDEC-WPC
TDEC-DWS
TDEC-GWMS

TDH-DLS

USDA-NRCS
UTIA

**3.11 MISSISSIPPI RIVER BASIN
HATCHIE RIVER – TUSCUMBIA RIVER
CYPRESS CREEK – MUDDY CREEK**



U.T. County Technical Assistance Service

UT-CTAS

Chickasaw-Shiloh RC&D Council

The local RC&D Council will oversee the project management as well as BMP implementation, and public awareness. The RC&Ds ability in these areas will be crucial to the generation of projects now and in the future.

Local landowners

Landowners will be requested to participate in the implementation of BMPs by allowing the BMP to be placed on their property, contributing to the construction of the BMP through in-kind services, and maintaining the BMP for a pre-determined or indefinite period of time, as designated in the NRCS Field Technical Guide. These same landowners will also be required to allow others to visit the BMP once it has been fully constructed.

McNairy County Soil Conservation District

The SCD is an partner in the effort to reduce nonpoint source pollution to the local waters. The SCD, can provide a significant amount of financial assistance to local water quality efforts. Through its direct interaction with the local NRCS district conservationist, the SCD can also direct technical as well as administrative assistance to local water quality projects. The SCD also serves as a leader in the effort to increase water quality education of the local citizens and operators.

McNairy County government

As McNairy County residential and commercial growth takes farmland of the Hatchie River-Cypress Creek watershed, its officials and residents will need to remain aware of and protect the existing Ag-related remediation work already in place. More importantly, government officials need to assume a leadership role in the nps effort by establishing water quality control measures for all construction sites and stormwater problem areas as growth continues.

CURRENT 319 PROJECTS

FY-95	Scenic Hatchie River-Bear Creek Restoration Demonstration	RC&D
FY-2000	Hatchie River Water Quality Restoration: Cypress Creek	RC&D

CURRENT MONITORING & ASSESSMENT

TDEC-WPC five-year watershed management approach
TDH-DLS pre- and post- BMP monitoring

**3.11 MISSISSIPPI RIVER BASIN
HATCHIE RIVER – TUSCUMBIA RIVER
CYPRESS CREEK – MUDDY CREEK**



MEASURES OF SUCCESS

- UWA projects have been implemented in all subwatersheds on the 1998 303(d) List in increasing numbers each year.
- Post BMP implementation monitoring results are indicating an overall improvement of the water quality of streams.
- The subwatersheds have been removed from the 1998 303(d) List due to sufficient water quality improvements.

MILESTONES

Long Term Goal 1.

Hold regularly scheduled meetings with stakeholders, to create new partnerships, strengthen existing partnerships and to foster greater trust, commitment and accountability.

- **Action:** Conduct an annual priority watershed partners meeting for project coordination.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDH-DLS; RC&D; local governments
Year(s): 2001-2005
- **Action:** Develop a Watershed Restoration Action Strategy.
Lead: TDA-NPS Program
Key Partners: TDEC-WPC; USDA-NRCS; TDEC-DWS-GWMS
Year(s): 2001

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

- **Action:** One hundred percent of agricultural and stream bank BMPs will be completed in the Muddy Creek subwatershed.
Lead: RC&D; USDA-NRCS and SCD
Key Partner: TDA-NPS Program
Year(s): 2005
- **Action:** Sixty percent of the of agricultural and stream bank BMPs will be completed in the Cypress Creek watershed.
Lead: RC&D; USDA-NRCS and SCD
Key Partner: TDA-NPS Program
Year(s): 2010

**3.11 MISSISSIPPI RIVER BASIN
HATCHIE RIVER – TUSCUMBIA RIVER
CYPRESS CREEK – MUDDY CREEK**



- **Action:** Water quality of Muddy Creek subwatershed will indicate improvement due to the BMP implementation efforts.
Lead: TDEC-WPC and TDH-DLS
Key Partners: TDA-NPS Program
Year(s): 2005

Long Term Goal 5.

Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution.

- **Action:** Develop at least two educational projects to educate the local citizens, landowners, and elected officials in the Cypress Creek- Muddy Creek subwatershed
Lead: TDA-NPS Program
Key Partner: RC&D, SCD, USDA-NRCS
Year(s): 2005

Long Term Goal 7.

Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

- **Action:** Pre-BMP implementation monitoring will have been completed and post-BMP implementation monitoring will be in progress in the Muddy Creek subwatershed
Lead: TDEC-WPC and TDH-DLS
Key Partners: TDA-NPS Program, USDA-NRCS, RC&D
Year(s): 2005

Action: Post-BMP implementation monitoring will have been completed in the Cypress Creek subwatershed.
Lead: TDEC-WPC and TDH-DLS
Key Partners: TDA-NPS Program, USDA-NRCS, RC&D
Year(s): 2010



Guidelines for Best Management Practice Installation With Funding Provided by the Agricultural Resources Conservation Fund (ARCF)
Fiscal Year 2001

1. Introduction

The Tennessee Department of Agriculture (TDA) is committed to reducing the impact of agricultural practices on the water resources of our state. Historically, funding has been provided to landowners through the Soil Conservation Districts (SCDs) for the installation of Best Management Practices (BMPs). In previous years, the measures of success have been in terms of tons of soil saved or total numbers of acres treated by BMPs. Recently, new initiatives by the federal government have made it essential that the measure of success be in terms of measurable water quality improvements. To this end, we strongly recommend the adoption by ARCF recipients of the following procedures.

BMP Selection Process

TDA recommends that each SCD begin the following process in advance of the Fiscal Year 2001 allocations, and complete it within approximately twelve(12) months.

Watershed Evaluations. All SCDs should assess the streams in their county, and should certainly be aware of the ones that are listed as impaired on the 303(d) List. Agricultural operations that are having an obvious negative impact on water quality should be identified by the SCD. The landowners in these areas need to be contacted directly by the District personnel, and encouraged to apply for cost share funding of the needed BMPs. Those SCDs that do not practice continuous signups are urged by TDA to hold their sign up in late winter or early spring, so that all required site visits can be made by the Regional Administrator prior to the SCD's submittal of their application for funding on or about May 1, 2000.

Watershed Prioritization. Following the evaluation of all the streams in the county and the signup date, the SCD board, the District Conservationist and the TDA Regional Administrator should collaborate to rank the applications for BMP cost share. The criteria for ranking needed BMPs should be developed at the local level, and it should focus on measurable water quality improvements. TDA recommends that SCDs develop a plan to systematically address all watersheds in their counties, with the ultimate goal of removing streams or segments of streams from the 303(d) List, and also to remove sources of impairment from streams not currently listed, so as to prevent them from ever being listed as an impaired water. This can be accomplished by focusing on one small watershed at a time, installing all needed BMPs within that small watershed and moving on to the next small watershed, utilizing a "worst watershed first" approach. In order to achieve these improvements to our waters, all BMP implementation programs must have a watershed focus. The process is this:

1. Select a small subwatershed,
2. Evaluate the watershed, identifying all BMPs that are needed to stop active erosion or the direct transport of pollutants to the state's waters,
3. Attempt to obtain 100% landowner participation in the watershed, through one-on-one meetings, or educational forums, etc.,
4. Make application for funding to TDA,
5. Install funded BMPs, and
6. TDEC personnel to conduct watershed monitoring after the BMP installations are complete.

Additional Funding. If at any time during the watershed evaluation the SCD becomes aware of water quality problems in their county that are not related to agricultural practices, and there is local interest in solving these problems, the SCD is encouraged to contact TDA and make an application for funding through the 319 nonpoint source program.

TDA recognizes that these recommendations could represent a change in the way funds are administered at the local level. It is imperative that the funds used through this program prove that voluntary cost share programs can restore impaired waters.

2. Guidance for BMP Implementation

Certain BMPs will be eligible to receive cost share funds through TDA's ARCF in Fiscal Year 2001. The funds will be administered locally through the Soil Conservation District Board of Supervisors in each of Tennessee's 95 counties, with the concurrence of TDA's Regional Administrators. Technical assistance will be provided by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). Specifications for all BMPs will be in accordance with the NRCS Field Technical Guide. Conservation Plans will be developed by the NRCS District Conservationist and will be strictly adhered to for the purpose of establishing eligibility for cost share payment. Higher rates of inputs may be used, however only those rates specified in the Conservation Plan will be eligible to receive cost share funding. Normal equipment and labor costs, whether privately hired or supplied by the cooperator (seedbed preparation, tractor usage, etc.) will not be eligible for cost share. Specialized equipment usage will be eligible for cost share, such as no-till drills, spriggers, bulldozers, backhoes, etc. Cost share for other specialized equipment will be evaluated on a case-by-case basis. The life span of all practices shall conform to NRCS requirements.

The cost share shall not exceed 75% of the cost of establishing agricultural BMPs, with a maximum payment of \$10,000 per person per year. The SCD Board of Supervisors may elect to set a lesser percent for cost shares, set a lesser maximum payment or use another payment system such as a flat rate. In the event of additional cost share funding from another source, the total amount of all cost shares shall not exceed 90% of the total cost of establishing the BMP.

3. BMP Specifics

Consistent with the TDA policy which was implemented in FY 2000, certain BMPs will be eligible for cost share without the need for a preliminary site visit from the Regional Administrator to determine eligibility. The following is a list of these **"No Site Visit Required" BMPs**:

Cropland Conversion

Grade Stabilization Structures

Sediment Control Basins

Diversions

Terraces

Grassed Waterways

Buffer/Filter Strips

Livestock Exclusion System. Components will include fencing, alternative watering sources, stream crossings, limited stream access and streambank stabilization and/or restoration, as needed.

Certain BMP will be eligible for cost share only after a site visit has been made to determine eligibility. The following is a list of these "**Site Visit Required**" BMPs:

Heavy Use Areas

Critical Area Treatment

Winter Cover. Seed for winter cover will be eligible for cost share at the 75% rate, but not to exceed \$5 per acre. No grazing, harvesting or haying will be allowed on winter cover practices. Seeding rates and dates will be either specified in the NRCS Conservation Plan or in accordance with the University of Tennessee Publication PB 378.

Ponds. Pond construction deemed eligible for funding must be a component of a livestock exclusion system or a rotational grazing system, consistent with the Conservation Plan. Ponds will be eligible for cost share at the 75% rate, but not to exceed \$1500.

Streambank Stabilization/Restoration, other than for Livestock Exclusion Rotational Grazing System

Seeding Practices. Seeding practices will be funded for the establishment of a permanent vegetative cover to be used for pasture or hay land. Establishment will be funded on Highly Erodible Land (HEL), and on tracts being converted from rowcrop, regardless of HEL designation. A soil test performed by a certified soil laboratory will be required. Cost sharing on lime and fertilizer will be based on soil test results. Eligible seeding rates and dates are those specified on the NRCS Conservation Plan or in accordance with the University of Tennessee Publication PB 378. Local SCD Boards, with the concurrence of the TDA Regional Administrator and the NRCS District Conservationist, have the option to extend seeding dates in the event that weather conditions prevent adherence to specified dates. Companion crop seeds (e.g. wheat) will not be eligible for cost share. Maintenance for a minimum for five years will be required on all permanent vegetative covers. Pasture and hayland renovation will be approved only where a soil loss potential exists (50% or more cover loss), and as recommended in the cooperators conservation plan. No funding for renovation will be given to pasture or hayland tracts where the soil loss tolerance "T" has been achieved.

Poultry Litter Storage

Facilities and Composters. A determination must be made that establishing such structures will result in water quality improvement at the site. The cost share will be at the 75% rate, not to exceed \$5,000.

Animal Waste Systems. The cost share for animal waste systems shall not exceed 75%, with the maximum payment to be determined by funding availability.

If a BMP is not listed on either of the above lists, then it would be classified as a Miscellaneous BMP, and as such, would be in the "Site Visit Required" Category. The need for the practice must be determined by the TDA Regional Administrator in consultation with the NRCS District Conservationist and approved by the SCD Board.

Forestry. Cost share assistance will again be furnished for forestry BMPs. All funded practices must demonstrate a direct positive impact on water quality.

Information and Education

(I&E) Projects. Projects that are directed toward landowners, producers and managers, such as field days, BMP demonstrations, seminars, informational material, and training/workshop events will be eligible, pending approval and funding availability.

Chapter/Sub-chapter	Title
0400-1	Abandoned Mine Lands
0400-1-24	Abandoned Mine Lands Reclamation Program
0400-3	Division of Surface Mining
0400-3-1	General Provisions
0400-3-2	Requirements for Surface Mining Permits
0400-3-3	Conclusion and Release Procedures
0400-3-4	Prospecting Permit
0400-4	Division of Water Resources
0400-6	
0400-7	Division of Geology
0400-8	Division of Forestry
1200-1	Bureau of Environmental Health Services Division of Food and General Sanitation (F and GS) Division of Solid and Hazardous Waste Management (S and HWM) Division of Ground Water Protection (GWP) Division of Superfund (DSF)
1200-1-4	Impounded Water (F and GS)
1200-1-6	Regulations to Governing Subsurface Sewage Disposal Systems (GWP)
1200-1-7	Regulations Govern Solid Waste Processing and Disposal in Tennessee (S and HWM)
1200-1-11	Hazardous Waste Management (S and HWM)
1200-1-13	Inactive Hazardous Substance Site Remedial Action Program
1200-1-14	Commercial Hazardous Waste Management Facilities (S and HWM)
1200-1-15	Underground Storage Tank Program
1200-3	Bureau of Environmental Health Services Division of Air Pollution
1200-3-9	Construction and Operating Permits
1200-3-14	Control of Sulfur Compounds Emission
1200-3-27	Nitrogen Oxides
1200-3-30	Acidic Precipitation
1200-4	Bureau of Environmental Health Services Division of Ground Water Protection Division of Water Pollution Control
1200-4-1	General
1200-4-2	Regulations for Plans, Submittal and Approval; Control of Construction; Control of Operation
1200-4-3	General Water Quality Criteria for the Definition and Control of Pollution in the Waters of Tennessee
1200-4-4	Stream Use Classification for Interstate and Intrastate Streams

1200-4-5	Effluent Limitations and Standards
1200-4-6	Underground Injection
1200-4-7	Natural Resource Development
1200-4-8	Rules and Regulations Applied to T.C.A. §69-1-1
1200-4-9	Water Well Licensing Regulations and Well Construction Standards Permits
1200-4-10	National Pollutant Discharge Elimination System General Permits
1200-5	Bureau of Environmental Health Services Division of Food and General Sanitation Division of Water Supply
1200-5-1	Public Water Supply Systems
1200-5-2	Public Sewage Systems
1200-5-5	Sewage Disposal for Proposed Subdivisions
1200-22	Division of Construction Grants and Loans
1200-22-2	State Grants
1200-22-4	State Loans
1200-22-6	State Revolving Loans
1660-1	Wildlife Resources
1660-1-1	Rules and regulations for State-Owned Access Areas
1660-1-3	Sale of Bream
1660-1-5	Fishing
1660-1-12	Leasing of State-Owned Property at Reelfoot Lake
1660-1-13	Seizure of Property Used In Violation of T.C.A. §51—427
1660-1-14	Refuges and Wildlife Management Areas
1660-1-16	Rules of Procedures for Hearing Contested Cases Before The Tennessee Wildlife Resources Agency
1660-1-17	Rules and Regulations Governing the commercial Use of Wildlife
1660-1-18	Rules and Regulations of Live Wildlife
1660-1-19	Reelfoot Water Management Permit
1660-1-22	Pearl Culture
1660-1-23	Rules and Regulations Governing Issuance of Warning Citations
1600-1-24	Rules and Regulations Governing the Use of Fishing Piers
1660-1-26	Rules and Regulations for Fish Farming, Catch-out Operations and Bait Dealers
1660-2	Boating
1680-2	Bureau of Highways
1680-2-1	Constructing Driveways on State Highway Right-of-Way
1680-2-2	Overweight and Overdimensional Movements on Tennessee Highways
1680-2-3&4	Relocation Assistance Program
1680-2-5	Cutting and Baling Hay Along Interstate Right-of-Way
1680-6	Utilities Division



1680-6-1	Rules and Regulations for Accommodating Utilities Within Highway Rights-of-Way
1680-7	Maintenance Division
1680-7-1	Rules and Regulations for Junkyard Control



INTRODUCTION

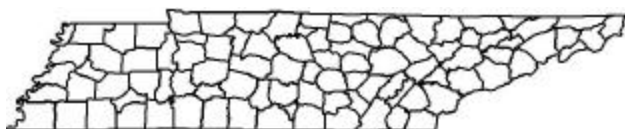
This chapter presents a general overview of the state of Tennessee. A brief description of the state's basic statistics, economy, land uses and trends, climate, and eight distinct landscape regions, called physiographic provinces are given. In each of the physiographic province sections (province), topography, major watersheds, geology, ground water (aquifer) regimes, soils, and primary nonpoint source pollution problems are discussed.

Water quality can be affected by point sources, such as municipal and industrial discharges, and by non-point sources, such as urban runoff, agricultural practices and construction activities. Only two percent of the state is occupied by urban and industrialized areas; however, the heaviest concentration of pollution problems in Tennessee occur in these areas.

On a regional basis, increased development threatens water quality in Middle Tennessee while agricultural runoff has a greater impact on West Tennessee waters. The effects of past mining and current re-mining tend to have the greatest impacts on water quality in the Cumberland Mountain region of East Tennessee.

A watershed is an area that drains to a particular lake or stream. Surface water in a watershed may flow across farm fields, forest land, suburban lawns and city streets, or it may seep into the soil and travel as ground water. There are 5 major watershed groups in the state. These watersheds, or hydrologic basins as they are often called, are discussed in detail in the Physiographic Provinces section.

BASIC STATISTICS



The state of Tennessee covers 42,244 square miles, encompasses 95 counties, and supports a population of over 5,112,800 people ⁽⁶⁾. There are over 60,000 stream miles and some 540,000

lake acres within Tennessee's boundaries. Approximately 74 percent of our stream miles and 78 percent of our lake acres have excellent water quality. However, we still face significant challenges in the continued improvement of Tennessee's water quality ⁽⁴⁾.

Water quality assessments made in 1996 included approximately 94 percent of the state's stream miles and, for the first time, 100 percent of the publicly owned lake acres in Tennessee. The number of stream miles assessed in 1996 increased by 38,247 miles over the 1994 assessment, giving us our best evaluation to date of statewide water quality.

Approximately 4.8 million people rely on public water systems for their drinking water. The state's public drinking water systems maintained a 97.3 percent compliance rate during 1996.

Most West Tennessee citizens rely on ground water for their drinking water. The city of Memphis has the largest ground water withdrawal (147 million gallons a day) of any municipality in the southeastern United States. For the state as a whole, approximately 1.5 million people rely on ground water from public water systems, some 300,000 people use combined ground water/surface water systems, and an additional 500,000 people get their drinking water from private wells and springs.



ECONOMY

The largest Tennessee employer is manufacturing. This includes the manufacturing of apparel, fabricated metal products, electronic and transportation equipment, appliances, chemicals, and food products. The printing and publishing industries are also very important.

The forestry products industry is the second largest Tennessee employer. This industry harvests about 800 million board feet per year of hardwood from oak, hickory, poplar, and elm making Tennessee the leader in the production of hardwood products. Hardwood products include flooring, log cabins, pencils, and lumber. Additionally, the harvesting of softwoods, such as pine and cedar, yield one billion board feet per year. Tennessee forests also produce soaps, turpentine, vanilla flavoring, toothpaste, newspaper, as well as furniture ⁽⁵⁾.

Tobacco is the leading crop in value, while other important economic crops include cotton, soybeans, hay, and corn. Primary sources of livestock income include beef and dairy cattle, swine, poultry, and equine operations.

Tennessee is the leading state in the production of ball clay, a key ingredient in ceramic and sanitary/whiteware production, and the harvesting of freshwater pearls and mussel shells associated with the jewelry industry. Tennessee ranks second in the production of zinc, while also extracting significant amounts of high - quality limestone, road aggregate limestone, aglime, barite, bituminous coal, dimension sandstone, high - silica sand, sand and gravel aggregate, oil, and natural gas. The state also has moderate deposits of copper, fullers earth, light - weight aggregate, marble, phosphate, and pyrite and significant reserves of lignite, a low grade, low sulfur coal (TN Division of Geology, 1992).

Major municipal centers:

- Chattanooga is the state's largest manufacturing center and a major insurance center.
- Gatlinburg and Pigeon Forge are neighboring tourist centers of great importance.
- Kingsport is a major printing and chemical production center.
- Knoxville is a major center for manufacturing and the home of the state's largest university.
- Memphis is the nation's second largest inland port and a leading distribution and higher education center.
- Nashville, the state's capital, is world - renowned for music recording and is a major insurance, banking, printing, health care, and higher education center.

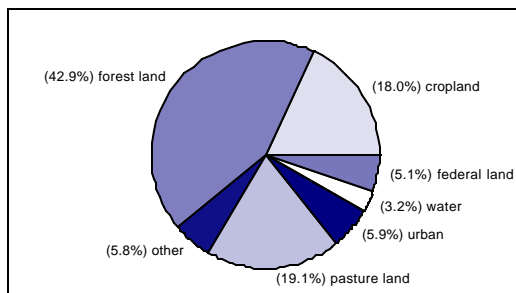
Aluminum is fabricated in Alcoa, while zinc is refined in Clarksville and transformed into sheets for pennies in Greeneville. Major wood and paper product facilities are located in the southeast and southwest portions of the state. At least three wineries exist in Tennessee, while whiskey is distilled in Lynchburg and Tullahoma. The Oak Ridge National Laboratory and University of Tennessee - Knoxville are nationally - recognized research institutions in nuclear and aerospace technology. The world's largest wind tunnel is located in the Engineering Development Center at the Arnold Air Force base in Tullahoma.

LAND USES AND TRENDS

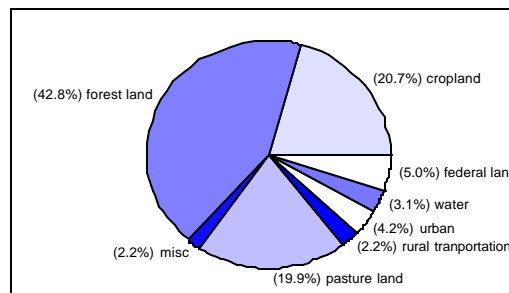
Nonpoint source pollution is often directly related to land use practices. Therefore, the types of land uses and land use trends are important factors in nonpoint source pollution mitigation and reduction. The greatest percentage (42.9%) of Tennessee's land area is dedicated to forested lands (11,580,000 acres or 18,094 square miles), while land areas used for agricultural activities (i.e., cropland and pastureland) ranked second at 37.1% (10,021,600 acres or 15,659 square miles) ⁽⁷⁾. The "Land Use In Tennessee – 1992" ⁽⁷⁾ figure below depicts the distribution of land uses in Tennessee.



Land Use in Tennessee - 1982



Land Use in Tennessee - 1992



CLIMATE

Tennessee has a temperate climate although rapid changes in weather conditions often occur. Variations in climate within the state are related to the diverse topography stretching from the lowlands of the Mississippi River bottoms in the west to the peaks of the Great Smoky Mountains in the east. Generally, the high terrains have cooler and wetter climates than the lowlands.

The average annual temperature varies from nearly 62 degrees Fahrenheit on the Mississippi River bottoms in the southwest to nearly 45 degrees Fahrenheit in the higher elevations of the east. Most of Tennessee is in the annual temperature range of 57 to 62 degrees Fahrenheit.

A significant portion of the state receives annual precipitation of 46 to 54 inches. The heaviest rains occur during late winter and early spring while the driest weather occurs during fall. East Tennessee is the site of both the largest and smallest average annual precipitation. The largest amount is about 80 inches per year atop the peaks of the Smoky Mountains, while the smallest is around 38 inches per year in the northeastern portion of the Valley and Ridge physiographic province. Average annual snowfall varies from four to six inches over most of the state except in the northeastern part where it is more than ten inches. A snow cover rarely lasts for more than a few days.

Southerly winds are frequent in all months of the year, but winds are strongest in summer. The average annual relative humidity is about 70 percent. Severe storms can be fairly common in Tennessee because of its positioning with respect to Pacific and Canadian weather systems versus weather systems originating in the Gulf of Mexico. Thunderstorms with strong winds, and occasional tornadic activity, are experienced at scattered locations throughout the state each year, mainly during the transitional seasons of spring and fall.

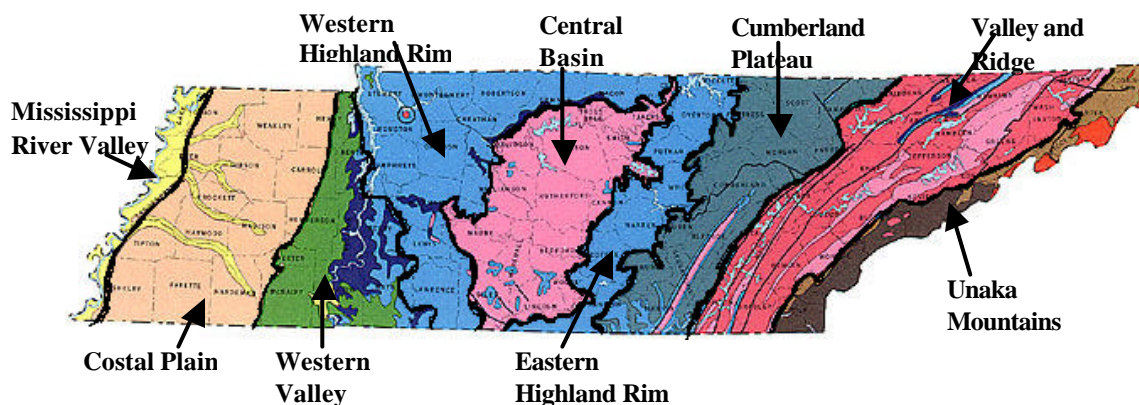
PHYSIOGRAPHIC PROVINCES

Tennessee's topography is among the most varied in the United States, ranging from wide, swampy river valleys in the west to mountains in the east with rolling hill country, karstic terrain, plateaus, mountains, deep gorges, and other features in between. Likewise, the subsurface geology (rock types and structure) and ground water aquifer configurations are quite varied. At least 700 caverns or caves (solution cavities) in association with karstic topographic features (open fractures, sinkholes, hummocky terrain, and subsurface drainage) serve as aquifers in 74 of Tennessee's easternmost counties ⁽¹⁾, while normal bedrock porosity serves as the aquifers in the state's westernmost counties.

On the basis of the distinct differences in topography and subsurface geology, Tennessee is divided into eight physiographic (or geomorphic) provinces. These provinces, from west to east, are the Mississippi River Valley, Coastal Plain, Western Valley, Western Highland Rim, Central

Basin, Eastern Highland Rim, Cumberland Plateau, Valley and Ridge, and Unaka Mountains. Although the state has been divided into 54 watersheds corresponding to the 8-digit USGS Hydrologic Unit Code (HUC); these watersheds are then combined in five groups according to year of implementation; Tennessee's water resources are divided into 14 major river basins. These river basins from west to east are Mississippi River Basin, Obion-Forked Deer River Basin, Hatchie River Basin, Memphis Basin, Western Tennessee Valley River Basin, Lower Cumberland River Basin, Upper Cumberland River Basin, Duck-Buffero River Basin, Elk-Shoal River Basin, Lower Tennessee River Basin, Upper Tennessee River Basin, Clinch River Basin, French Broad River Basin, and Holston River Basin.

The topography, major watersheds, subsurface geology, soils, vegetation, land uses, and primary nonpoint source pollution problems for each of these physiographic provinces are described in the following section.



Mississippi River Valley

The Mississippi River forms the western border of Tennessee, which is common to Arkansas and Missouri, with some variation because of river course changes since the boundary was established. From the Kentucky - Tennessee state line, the Mississippi River flows in a southerly direction for about 200 miles to the Tennessee - Mississippi state line. The Mississippi River flood plain in Tennessee is as much as 14 miles wide. Due to periodic flooding, the valley floor is continuously covered with sediment. The Mississippi River Valley province covers 637 square miles in Tennessee. The Mississippi River Valley province encompasses that portion of the Mississippi River basin within Tennessee and minor tributaries not included in the Obion - Forked Deer River, Hatchie River, or Memphis Basin. With the exception of portions of Memphis, which extends into this basin, there are no significant urban areas within the Mississippi River Valley province.

One of the most interesting geologic features of this physiographic province, Reelfoot Lake in the northwestern corner of Tennessee, is a result of the great New Madrid earthquakes of 1811 through 1813. Earthquakes, with three of the highest recorded readings (8.1 to 8.3 equivalence on the Richter scale) in the United States, occurred here to produce a shallow depression known as Reelfoot Lake. There are many deep - seated faults throughout much of this area, and some of the bluff lineations along the river valley, such as those adjacent to Reelfoot Lake, may trace these faults ⁽²⁾.

The Mississippi River Valley province is characterized by deposits of sand, silt, clay, and gravel and is a highly productive agricultural area and contains the highest percentage of crop and farm land in Tennessee. The nearly level valley bottom has soils with a high natural fertility, and medium to high available water capacities. Nearest the river the soils are loamy and well to moderately well - drained. Generally, the soils become more clayey and wetter with distance



from the river. In back swamp and old slough areas, where fine - textured sediment settled out of still or slow - moving water, soils are dark colored, clayey, and poorly - drained. The soils on the upland and floodplain are susceptible to erosion.

Most of the land is intensively cultivated in soybeans, cotton, and corn. Flooding and excess water are problems for development and agriculture in this region. Efforts to control the natural, cyclical flooding of the flood plain, and drain the once extensive riverine wetlands, many miles of levees, dikes, and channelization projects have been constructed along the rivers in this province.

The primary nonpoint source pollution sources in the Mississippi River Valley basin result from agriculture, active and abandoned mining (sand and gravel), failing septic systems, hydromodification, and construction. The extensive hydromodification projects, along with the naturally erodible soils in the province, have exacerbated the nonpoint source pollution problems.

Coastal Plain

The Coastal Plain of West Tennessee is an area of relatively low elevation and relief with sediments having the same characteristics as the coastal provinces of other southeastern states. This province of the state may be divided into two components, the West Tennessee Plain to the west and the West Tennessee Uplands to the east ⁽³⁾.

West Tennessee Plain

The West Tennessee Plain component of the Coastal Plain province is a zone of less hilly, in some places nearly flat, terrain that slopes gently westward toward the Mississippi River. Its western limit is marked by low bluffs (about 100 feet) adjacent to the Mississippi River flood plain. The most prominent topographic features of the Coastal Plain of West Tennessee are these bluffs and the broad flood plains of meandering streams.

The West Tennessee Plain physiographic province includes three major watersheds: Obion - Forked Deer River, Hatchie River, and the Memphis Basin.

In Tennessee, the Obion - Forked Deer and Hatchie Rivers encompass 4,412 and 1,877 square miles, respectively. Topography is characterized as gently rolling, interrupted by small streams and drainage divides. Some gullied topography has developed and wetlands are common.

The Memphis Basin covers 1,461 square miles, and includes the Loosahatchie and Wolf River watersheds along with the Nonconnah Creek watershed. Topography in the Memphis Basin is characterized as gently rolling, interrupted by small streams and drainage divides. Some gullied topography has developed and wetlands are common. Normal ground water regimes exist in porous unconsolidated sediments and overlying porous soils throughout this province.

West Tennessee Uplands

The West Tennessee Uplands component includes the divide between the Tennessee and Mississippi River drainages. The average elevation in the uplands is about 500 feet, with some elevations over 700 feet in Natchez Trace State Park and Forest. The West Tennessee Uplands encompasses portions of three major watersheds: Hatchie River, Obion River, and Western Tennessee Valley.

The geology of the West Tennessee Uplands is characterized by age sand, with lesser amounts of silt, clay, and gravel. These deposits are marine and nonmarine in origin.

The West Tennessee Uplands province is an important farming area and has one of the highest percentages of crop land in Tennessee. Soybeans, cotton, and corn are the main



crops. In the West Tennessee Uplands, most of the good crop land is in the wide bottoms and adjacent terraces, and in small scattered tracts in the uplands. Soybeans, cotton, and corn are grown extensively on the bottoms and low terraces and in small fields in the uplands. The uplands are used largely for hay meadows, pasture, and forests.

The primary nonpoint source problems in this province stem from the highly erosive soils, and extensive hydromodification in the region. Excessive sedimentation in the streams is a major source of nonpoint source pollution. This area has undergone vast hydromodification, such as channelization and flow modification, which has negatively impacted water quality. The extensive agricultural activities in this basin are also sources of nonpoint source pollution. Other sources of nonpoint source pollution are natural, animal holding lots, active and abandoned mining (ball clay, fullers earth, river and terrace gravels), failing septic systems, silviculture, streambank modifications, lack of riparian vegetation, and stormwater.

The Memphis Basin is also impacted by pasture land runoff, urban runoff, land development, and road and bridge construction, as well as industrial and municipal point sources.

Western Valley

The Tennessee River in West Tennessee flows northward across the state for approximately 110 miles serving as the demarcation line between middle and west Tennessee. The sides of the river valley are extensively dissected by many small tributaries. The valley is as much as 20 miles wide, and its flood plain ranges in width from three and one - half to one and one - half miles ⁽³⁾. The Western Tennessee River basin covers 3,905 square miles of land and water area.

The geology of the Western Valley province is dominated by limestone, chert, shale, and sandstone of the Devonian to Silurian ages. The soils are typically fluvial deposits of sand, silt, and gravel. Normal ground water regimes exist in porous bedrock and overlying porous soils in the western portion, while fracture - and solution cavity - controlled ground water regimes exist beneath the normal ground water regimes of the overlying porous soils.

The primary sources of nonpoint source pollution in this province arise from agriculture, active and abandoned mining (limestone), failing septic systems, silviculture, and hydromodification, such as channelization, dredging, and impoundments. The portion of the Tennessee River in this region has two large impoundments at the Kentucky and Pickwick dams. These impoundments can create nonpoint source pollution from poor quality dam discharge waters. These impoundments create higher water levels and slower flow rates conducive to nonpoint source pollution throughout the province.

Western Highland Rim

The Western Highland Rim is characterized by dissected, rolling terrain that is crossed by numerous streams. The Highland Rim physiographic province encompasses portions of four major watersheds: Lower Cumberland River, Upper Cumberland River, Duck River, and Elk Shoal.

Eastern Highland Rim

The Eastern Highland Rim is marked by a highly dissected steep slope that rises from the rolling lowland area of the Central Basin. Cutting into the rim are numerous narrow valleys, some of which have waterfalls. Along the outer ten miles of the south-central part of the Eastern Rim is an area of nearly flat terrain known as the Barrens, principally in Coffee, Cannon, and Warren counties. This area is unusually level and contains numerous swamps ⁽³⁾. The Eastern Highland Rim physiographic province encompasses portions of the major watersheds: Lower Cumberland River, Upper Cumberland River, Duck River, and Elk - Shoal River.



The Highland Rim, in general, is composed of predominately Mississippian - age limestone, shale, siltstone, sandstone, dolomite, and chert. A dominant feature of the Highland Rim is karst (an area of irregular limestone where erosion has produced sinkholes, fissures, underground streams, and caverns) terrain. Karstic topography is prominent in two extensive areas of the Highland Rim. One area is found in the Western Highland Rim just north of Clarksville and Springfield to many miles into Kentucky; the other less extensive area is found in the Eastern Highland Rim. In addition to these two karstic areas, there are as many as 300 known caves and a plethora of sinkholes throughout the Highland Rim⁽¹⁾. Fracture - and solution cavity - controlled ground water regimes exist beneath the normal ground water regimes of the overlying porous soils. The thin soils of the karstic areas do not provide the natural filtration and cleansing function that is typical of thicker soils.

Generally, the soils of the Highland Rim are very thick, strongly acidic, highly leached, well - drained, and low in natural fertility.

The largest areas of good crop land in the Highland Rim physiographic province are on the eastern part near the Kentucky - Tennessee state line. Suitable crop land is interspersed in forest land in small tracts on the western part. Pasture lands, hay meadows, and tobacco fields are the leading agricultural land uses. Corn and soybeans are locally important.

The primary sources of nonpoint source pollution in this province are agriculture, active and abandoned mining (limestone), failing septic systems, silviculture, reservoirs among other hydromodifications, and problems related to karstic terrain.

Central Basin

The Central Basin is a semi - curved area enclosed by the Highland Rim. It is characterized by gently rolling to hilly terrain, with some nearly level areas, and by meandering, low - gradient streams. It was formed by the erosion of the Nashville Dome, the structural center of which coincides with the geographic center of the basin. Murfreesboro is adjacent to the center (Miller, 1974).

The Central Basin physiographic province encompasses four major watersheds: Lower Cumberland River, Upper Cumberland River, Duck River, and Elk - Shoal River.

The outer areas and major drainage divides of the basin are characterized by hilly terrain. There are numerous hills capped by siliceous rock, some nearly 1,300 feet in elevation. The inner part of the basin is less hilly than the outer areas. These areas are further characterized by the lack of surface drainage and by other karst features such as caves and sinkholes.

The geology of the Central Basin is characterized by marine limestone, dolomite, and shale, and nonmarine sandstone and conglomerates. These rock units are Ordovician in age. Karst features, such as sinkholes, cave systems, and subsurface drainage are abundant in the carbonate bedrock. At least 240 known caves exist in the Central Basin province⁽¹⁾. Fracture - and solution cavity - controlled ground water regimes exist beneath the normal ground water regimes of the overlying porous soils.

The soils of the outer part of the Central Basin are generally moderately steep, well drained, and have clayey subsoils of moderately slow to slow permeability. They are typically high in phosphorus. The soils in the interior portion of the Central Basin are undulating and many are thin.

Soils suitable for row crops are in small tracts on bottoms and benches, pasture lands and hay meadows are the leading agricultural land uses. Many of the steepest slopes are in forest.



Several larger urban centers are located in the Central Basin, including Nashville, Franklin, Gallatin, Lebanon, and Murfreesboro.

Primary nonpoint source pollution problems in this province are related to agriculture, active and abandoned mining (limestone and phosphate), failing septic systems, silviculture, reservoirs along the Cumberland River and its tributaries, other hydromodifications, urban runoff, and karstic terrain.

Cumberland Plateau

The Cumberland Plateau, immediately east of the Highland Rim, is the name given to the southern portion of the structural province known as the Appalachian Plateaus. The east side forms a prominent escarpment, whereas the western margin is more irregular. The average height of the east side escarpments is 900 feet. The general plateau elevation is approximately 1,700 to 1,900 feet. Although essentially flat throughout most of its extent, the Cumberland Plateau has some rolling terrain and mountains which rise above the general plateau level. Mountainous areas north of Oak Ridge have elevations over 3,000 feet, with the highest point being Cross Mountain at 3,534 feet ⁽³⁾.

Dissecting into the plateau are numerous deep gorges and two prominent linear valleys: the Sequatchie Valley in the southwest and the much smaller Elk Valley in the northeast. Sandstone capping the plateau forms prominent cliffs and many waterfalls. The best known and highest waterfall (256 feet) is Fall Creek Falls, located in Van Buren County (Miller, 1974)

The Cumberland Plateau includes portions of three major watersheds: Upper Cumberland River, Lower Tennessee River, and Upper Tennessee River.

The soils on the Cumberland Plateau have formed from the sandstones and shales are predominately well - drained and loamy. Soil thickness varies from one to four feet. These soils are very strongly acidic and low in natural fertility, but respond well to proper management. Ledges of sandstone are common on slopes.

Most of the Plateau is in mixed hardwood forests. Pasture lands and hay meadows are the leading agricultural land uses, while small fields of corn, small grain, tobacco, and vegetables are grown.

The primary nonpoint source problems in this province arise from agriculture, active and abandoned surface and subsurface coal mining, failing septic systems, silviculture, hydromodifications, such as dams and channelization, storm water, and sewer overflow.

Valley and Ridge

The Valley and Ridge province, sometimes referred to as the Valley of East Tennessee, extends from the steep slope of the Cumberland Plateau on the west to the Unaka Mountains on the east. This province is characterized by numerous, elongate, parallel ridges and intervening valleys, all trending in a northeast - southwest direction. This orientation is the result of folding and fracturing during a mountain building episode 230 to 260 million years ago. The most prominent ridges are to the north: Clinch and Powell Ridges, and Bays Mountain ⁽³⁾.

The Valley and Ridge province includes five major watersheds: Clinch River, Holston River, French Broad River, Lower Tennessee River, and Upper Tennessee River.

The rocks which form the Valley and Ridge physiographic province are Cambrian to Ordovician - age limestones, dolomites, siltstones, sandstones, shales, and cherts. Fracture - and solution cavity - controlled ground water regimes exist in the bedrock beneath the normal ground water regimes of the overlying porous soils.



The soil pattern in this province is complex as a result of the heterogeneous geology. The soils are predominately well drained, with most being highly leached and low in natural fertility.

Suitable soils for crop land are in small tracts. Much of the land is productive for pasture and hay. The leading agricultural land uses are pasture lands, hay meadows, tobacco fields, and small scattered fields of corn, small grain, and soybeans. Many of the highest and steepest ridges are in forests

The primary nonpoint source pollution sources in this province are related to agriculture, active and abandoned mining (barite, high - silica sand, limestone, marble, shale, and zinc), failing septic systems, silviculture, hydromodification (e.g. dams, channelization, streambank modifications, upstream impoundments), storm water, and urban runoff. The best land for agriculture and urban growth is in the narrow, flat valley bottoms. The scarcity of flat land results in riparian buffer zones being greatly reduced or completely absent, which exacerbates nonpoint source pollution problems arising from surface runoff.

The Unaka Mountains

The Unaka Mountains in eastern Tennessee are a part of the Appalachian Mountains that are referred to as the Blue Ridge elsewhere. These mountains are characterized by rugged terrain, heavily forested slopes, and rushing streams with waterfalls. The highest point in Tennessee is Clingman's Dome, with an elevation of 6,642 feet. The Great Smoky Mountains are that portion of the Unakas located within the Great Smoky Mountains National Park. The Unakas also include outlying ridges which include Chilhowee, English, Bean, Meadow Creek, Holston, Starr, Roan, and among others (Miller, 1974).

The Unaka Mountains province includes four major watersheds: Holston River, French Broad River, Lower Tennessee River, and Upper Tennessee River.

The oldest rocks in Tennessee are found in the Unaka Mountains. The Unaka Mountains are composed of pre - Cambrian and Cambrian igneous (granite and rhyolite), metamorphic (gneiss, quartzite, slate, schist, and phyllite), and meta - sedimentary (sandstone, conglomerate, arkose, and graywacke) rocks. Normal ground water regimes exist in the semi - porous bedrock and overlying porous soils.

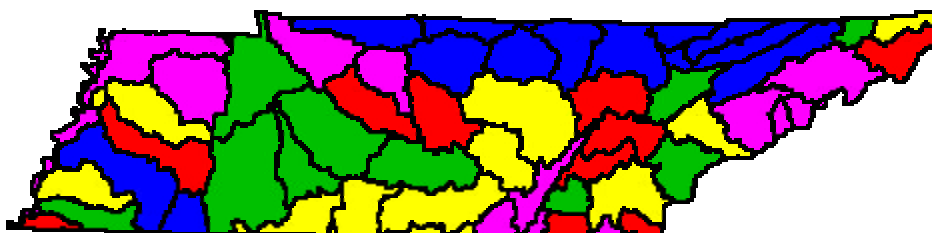
The soils of the Unaka Mountains are predominately well - drained to excessively drained, and are rich in weatherable minerals, such as micas, feldspars, and iron sulfides (in the Copper Basin). The soils are loamy and contain varied amounts of rock fragments.

The Unaka Mountains are mostly forested. Exceptions to this are the broader peaks or "balds" which are covered with meadows and groves of mountain laurel and the coves which have been used for pasture lands by previous property owners. Much of this region is located within the Great Smoky Mountains National Park and the Cherokee National Forest lands.

The primary sources of nonpoint source pollution in this province are related to agriculture, failing septic systems, silvi culture, hydromodification activities, and urban growth.

Major Watersheds of Tennessee

NPS Management Program Document – Appendix E
General Characteristics of Tennessee



	West Tennessee	Middle Tennessee	East Tennessee
Group 1	<ul style="list-style-type: none"> • Nonconnah • South Fork of the Forked Deer 	<ul style="list-style-type: none"> • Stones • Harpeth 	<ul style="list-style-type: none"> • Tennessee (in Meigs & Rhea Counties) • Watts Bar • Ocoee • Emory • Watauga
Group 2	<ul style="list-style-type: none"> • Loosahatchie • North Fork Forked Deer • Forked Deer 	<ul style="list-style-type: none"> • Collins • Caney Fork • Wheeler Lake • Upper Elk • Lower Elk • Pickwick Lake 	<ul style="list-style-type: none"> • Hiwassee • Fort Loudoun / Little • South Fork Holston
Group 3	<ul style="list-style-type: none"> • Wolf • Tennessee Western Valley (Beech) • Tennessee Western Valley (KY Lake) 	<ul style="list-style-type: none"> • Upper Duck • Lower Duck • Buffalo 	<ul style="list-style-type: none"> • Tennessee (Hamilton Co. w/o Chattanooga) • Little Tennessee • Lower Clinch • North Fork Holston
Group 4	<ul style="list-style-type: none"> • Lower Hatchie • Upper Hatchie 	<ul style="list-style-type: none"> • Red • Barren • Cumberland (Old Hickory Lake) • Upper Cumberland (Cumberland Lake) • Upper Cumberland (Cordell Hull) • Obey 	<ul style="list-style-type: none"> • South Fork Cumberland • Upper Cumberland • Powell • Upper Clinch • Holston • Tennessee (Chattanooga Area)
Group 5	<ul style="list-style-type: none"> • Mississippi • North Fork Obion • South Fork Obion 	<ul style="list-style-type: none"> • Lower Cumberland (Lake Barkley) • Lower Cumberland • Gunter'sville Lake 	<ul style="list-style-type: none"> • Tennessee (Marion County) • Sequatchie • Conasauga • Upper French • Lower French • Pigeon • Nolichucky



REFERENCES

- (1) Barr, Thomas, C. 1972. Caves of Tennessee. Tennessee Department of Conservation, Division of Geology, Nashville, TN. pp 1 - 5.
- (2) Fuller, M.L., 1912. The New Madrid Earthquake. U.S. Geological Survey, Bulletin 494, 119 pp.
- (3) Miller, Robert A., 1974. The Geologic History of Tennessee, Tennessee Department of Conservation, Division of Geology, Nashville, TN. 63 pp.
- (4) Tennessee Department of Environment and Conservation, Web-site, Updated January 12, 1998
- (5) Tennessee Forestry Association, et al, 1996. Our Tennessee Family Tree - Celebrating Tennessee's Bicentennial 1796 - 1996 and Releaf Tennessee (poster). Nashville, TN.
- (6) U.S. Census Bureau, 1990. Census of Population and Housing, U.S. Department of Commerce, Washington, D.C.
- (7) U.S. Natural Resources Conservation Service, 1997. Status, Conditions, and Trends: Natural Resources in Tennessee (unpublished). U.S. Department of Agriculture, Nashville, TN.

TDA-NPS Management Program Document – Appendix F
LIST OF ACRONYMS



American Society of Civil Engineers	ASCE
American Society of Landscape Architects (Certified landscape architects)	ASLA
Associated Builders and Contractors	ABC
Austin Peay State University	APSU
Boone Watershed Partnership	BWP
Brownfields Program	BP
City of Chattanooga	COC
Cumberland River Compact	CRC
East Tennessee State University	ETSU
Environmental Protection Agency	EPA
Federal Highway Administration	FHWA
Great Smoky Mountains Institute at Tremont	GSMIT
Home Builders Association of Tennessee	HBAT
Ijams Nature Center	INC
Izaak Walton League	IWL
Kennecott Energy Company Sequatchie Valley Coal Company	SVCC
Keep America Beautiful chapters (more than 31)	KAB
Keep Tennessee Beautiful Program/Univ. of Memphis	KTB
Keep Blount Beautiful	KBB
Kentucky Department for Environmental Protection Division of Water Nonpoint Source Program (AMD reclamation monitoring)	KY-NPS
Knoxville Water Quality Forum	KWQF
Mid-South Fly Fishers	MSFF
Motlow State Community College	MSCC
North Chickamauga Creek Conservancy (AMD reclamation)	NCCC
Save Our Cumberland Mountains (citizen oversight)	SOCM
Sequatchie Valley Coal Co. – Kennecott Inc. (remining project)	SVCC
State Soil Conservation Committee	SSCC
Soil Conservation Districts (all 95 counties)	SCD
Tennessee American Planning Association	TAPA
Tennessee Association of Conservation Districts	TACD
Tennessee Association of Utility District	TAUD
Tennessee Aquarium	TN-AQ
Tennessee Citizens for Wilderness Planning (citizen oversight)	TCWP
Tennessee Conservation League	TCL
Tennessee Contractors Association	TCA
Tennessee County Services Association	TCSA
Tennessee Department of Agriculture	TDA
Agricultural Resources Conservation Fund	-ARCF
Forestry Division	-Forestry
RAMP efforts	- RAMP
Regulatory Services	- RS
Tennessee Department of Economic and Community Development: Office of Local Planning	TDECD

TDA-NPS Management Program Document – Appendix F
LIST OF ACRONYMS



Tennessee Department of Education	TDE
Tennessee Department of Environment and Conservation	TDEC
Division of Community Assistance	-DCA
Division of Geology	-DG
TN Oil & Gas Board (orphan well plugging & site reclam.)	TOGB
Division of Ground Water Protection	GWP
Division of Natural Heritage	DNH
Division of Solid Waste Management	SWM
Division of Water Pollution Control	WPC
Aquatic Resources Alterations Permit (sand & gravel)	ARAP
Land Reclamation Section (AMD & non-AMD reclamation)	LRS
Mining Section (NPDES permit)	MS
MS4 Program	MS4
West Tennessee River Basin Authority	WTRBA
Division of Water Supply	DWS
Ground Water Management Protection	GWM
Source Water Assessment Program (assessments)	SWAP
Underground Injection Control Program	UICP
Wellhead Protection Program	WPP
Environmental Assistance Centers	EACs
Environmental Policy Office	EPO
Tennessee Department of Health, Division of Lab Services	TDH-DLH
Tennessee Department of Transportation	TDOT
Tennessee Department of Tourism	TDT
Tennessee Environmental Education Association	TEEA
Tennessee Farm Bureau	TFB
Tennessee Farmers Cooperative	TFC
Tennessee Forestry Association	TFA
Tennessee Golf Course Superintendent's Association	TGCSA
Tennessee Higher Education Council	THEC
Tennessee Home Builders Association	THBA
Tennessee Housing Development Authority	THDA
Tennessee Municipal League	TML
Tennessee Nurserymen's Association	TNA
Tennessee Parks & Greenways Foundation	TP&GF
Tennessee Realtors Board Association	TRBA
Tennessee Resource Conservation and Development Councils	TNRC&D
Appalachian RC&D Council	Appal. RC&D
Buffalo – Duck RC&D Council	B – D RC&D
Chickasaw - Shiloh RC&D Council	C-S RC&D
Clinch - Powell RC&D Council	C-P RC&D
Five Rivers RC&D Council	Five Rivers
Hull – York Lakeland RC&D Council	H – YL RC&D
Smoky Mt. RC&D Council	SMRC&D

TDA-NPS Management Program Document – Appendix F
LIST OF ACRONYMS



Southeast TN RC&D Council	SETN
Tennessee Society of Professional Engineers	TSPE
Tennessee State University	TSU
Tennessee Technological University	TTU
Tennessee Valley Authority	TVA
Tennessee Wildlife Resources Agency	TWRA
The Nature Conservancy	TNC
United States Army Corps of Engineers	USACE
United States Department of Agriculture	USDA
- Natural Resources Conservation Service	-NRCS
Farm Services Agency	-FSA
Forest Service	USFS
United States Coast Guard	USCG
University of Memphis	UM
University of Tennessee	UT
Agriculture Extension Service	UTAES
Institute of Agriculture	UTIA
Center for Industrial Services	UTCIS
Civil & Environmental Engineering Department	UTCEED
Water Resources Research Center	UTWRRC
US Cherokee National Forest	USCNF
US Fish & Wildlife Service	USFWS
US Geological Survey	USGS
USDI - Office of Surface Mining (SMCRA permit)	OSM
USDI - National Park Service	USNPS
UT County Technical Assistance Service	UT-CTAS
UT Experiment Station	UTES
UT Municipal Technical Advisory Service	UT-MTAS
Williamson County Schools	WCS